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Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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The Oppau Explosion

IN spite of the intense struggles waged between English and German chemists during the war years, and of the commercial rivalry which must exist in the future, a feeling of deep sympathy passes across to German chemists in their loss at Oppau. It would be idle to hide our appreciation of the merits of German technology as revealed in the magnificent nitrogen-fixation works at Oppau, the disaster to which was fully reported in our columns last week. The experiments of French and English chemists—particularly those of Le Chatelier—laid the foundation for the work of Haber, who established the conditions under which nitrogen and hydrogen combine to form ammonia, in the presence of catalysts. These experiments were followed by a period of nearly 10 years of exhaustive and painstaking research by Dr. Mittach and the chemists of the Badische Anilin und Soda Fabrik. The chemical and engineering problems associated with the production of large quantities of pure hydrogen and nitrogen, with the use of hydrogen under high temperatures and pressures, with compression to 200 atmospheres, and with ammonia recovery from admixture with 90 per cent. of uncombined gases, &c., were solved, so that in 1913 the plant at Oppau commenced to manufacture synthetic ammonia at a rate of 25 tons per day. Under the stress of war the Oppau plant was extended and developed to a capacity of 200 tons per day in 1918, and 250 tons per day in 1920. In 1918, 70,000 tons of ammonia were produced, and from it, in part, 40,000 tons of nitric acid and 10,000 tons of ammonium nitrate.

What were the causes of the explosion? What will be the effect upon German industry and fertiliser supply, and what influence will the disaster have upon our own chemists and financiers developing Haber plants? With regard to the first of these matters, it is unwise to speculate in the absence of more definite knowledge. Many "theories" have been advanced, and it would require but little imagination to propound yet another, namely, that a German chemist had succeeded in unlocking atomic energy, and from a cubic foot of hydrogen—by catalytic transformation into helium—had developed energy equivalent to that of several million cubic feet of high calorific value coal-gas. The hypothesis that the disaster was due to the explosion of a new gas during compression will receive little credence from chemists, in the absence of further information. One report which appears to have substantial foundation—coming officially, it is stated, from the Badische undertaking—is that the magnitude of the disaster was due to the explosion of ammonium salts in a storehouse variously reported as containing from 200 to 4,000 tons of ammonium salts, including nitrate, sulphate, chloride, &c. (As a matter of fact, separate storehouses were erected at Oppau for the various products.) It is, however, clear that our present notions as to the stability of ammonium salts—especially the nitrate—will have to be carefully considered and perhaps revised. It will be remembered that the British high explosive "Amatol" contained, in one form, 80 per cent. of ammonium nitrate, associated with 20 per cent. of TNT, but the explosion of pure, dry ammonium nitrate, *per se*, under the conditions obtaining at Oppau is, to say the least, unexpected.

What influence will the destruction of the Oppau works have upon German industry, apart from the loss in life and material, which has been heavy indeed? The Oppau works produced chiefly ammonia, and ammonium salts, including, it may be noted, ammonium chloride by the Solvay process, an application of synthetic ammonia which is, of course, contemplated in the new Brunner, Mond works which are being erected at Billingham-on-Tees. Nitric acid was produced from the ammonia by oxidation in the presence of a catalyst consisting of the oxides of iron, manganese and chromium, suitably agglomerated.

It must, however, be remembered that the plant at Merseburg, constructed since 1916, has a capacity of 500-600 tons of ammonia per day, and when completed will be capable of manufacturing 800 tons per day. This quantity is sufficient to supply all German needs in respect of ammonia and nitrogen compounds derived from it. Thus, the German consumption of fertilisers before the war was equivalent to 210,000 tons of fixed nitrogen per annum, more than half of which was imported. The Merseburg plant alone should produce this quantity to-day, and when completed its output will represent a quarter of a million tons of fixed nitrogen per annum. This, coupled with the fixed nitrogen available from cyanamide plants, and from coal-gas and coke by-product recovery plants, should ensure a definite surplus over Germany's present requirements. The surplus available for export will obviously be reduced, and this should be a factor in inducing other countries, including our own, to press forward with nitrogen-fixation projects. The second report of the Nitrogen Products Committee, recently published, demonstrated how little actual manufacturing progress has been made in this country. Moreover, the only Haber-type plant outside Germany is that constructed for the American Government, and this was never operated with real success. Finally, the enormity of the Oppau disaster should not discourage in any way the nitrogen-fixation projects on hand in this country. It will not be taken as evidence of lack of sympathy when we state that we must profit by the experience, even if grievously unfortunate, of others. The problems of working with large volumes of hydrogen are probably completely solved; and others concerned with the energy of the catalytic combination of nitrogen and hydrogen, with the storage and properties of ammonium salts, &c., should be capable of ready solution.

Blast Furnace Gas Cleaning

A CORRESPONDENT writes to ask if we can supply him with any information concerning the modern methods employed for gas cleaning in blast-furnace plants. Curiously enough several of our readers have lately sought similar information, and we can, perhaps, best deal with them collectively by tracing out in these columns some of the recent work which has been done. We may commence by referring those who are interested to the Proceedings of the Iron and Steel Institute for May last, where will be found a most concise description of the plant erected in the early days of the war by Palmer's Shipbuilding Company at Jarrow. At the outbreak of the war the first German gas-cleaning plants that were being erected in this country were still unfinished, and with the departure of the German engineers the works were left without the data and guidance necessary for the successful completion and operation of the apparatus. Hence the work had to be carried out with great caution. Much of the original theory had to be discarded, and fresh theories evolved from data obtained under actual working conditions. Several factors were found not to be working out as was expected, and the plant and its operation had gradually to be improved. Much of the success attained was due to the work of Mr. S. H. Fowles, who has stated that the main advantages attending the use of thoroughly cleaned blast-furnace gas are as follows:—"There is a most productive field for the recovery of potash from the dust taken from the crude gas; three to four million horse-power could be produced from the waste blast-furance gases of this country, in addition to reducing large coal bills, speeding up works, and undertaking much of the work now done by coal-fired boilers; it would enable the old steam-driven blowing engines to be superseded and render blowing by large and efficient gas engines easy; and the electrical equipment of large works could be developed on a larger scale at lower cost than was ever anticipated.

According to Mr. Fowles about 3½ million cubic feet of gas are being produced per hour at Jarrow; and, with the same quantity of gas made as prior to the introduction of the cleaning plant, 8,500 extra horse-power is being obtained with considerably less labour, and it is hoped that this figure will be increased to about 12,000 H.P. The power supply for the whole of the works, which was previously bought, amounts to 88,000 kw.-hours per day, costing a little over 1d. per unit, and is now being produced entirely from waste gases at about 20 per cent. of the unit cost. This result is entirely due to the introduction of gas cleaning, which allows the gas to be used for engines. The gas is found to be on an average cleaner than the atmosphere of the district in which the plant is situated. When the plant at Jarrow was first started the boilers only were supplied with the cleaned gas, for a period of six months. The hot-stove burners were then converted for cleaned gas, which for two months was used with all boilers and stoves. Next some of the gas-driven blowing engines and generating engines were started, and a large portion of the boilers shut down. Now the boilers have been entirely dispensed with for power purposes. When the cleaned gas was first brought into use the result was to increase the hot-stove temperature from 800°F. to 1,100°F., and the make of pig iron by 10 per cent. The coke for the furnaces was reduced by 250 tons a week and the coal for the boilers by 180 tons, the saving thus effected per week amounting to £600 gross, or £520 net, after deducting wages on the gas plant, energy for the motors, and stores and repairs. The plant at Jarrow is of the Halberg-Beth type, and from the above details it will be gathered that the process is one which is destined to play an important rôle in the economics of running works of the kind.

The names of Lodge and Cottrell will always be associated with electrical deposition, and the result of their work is now found in important instances in this country. There are now some 150 Cottrell installations at work in various parts of the world, and those who are anxious for information on the subject cannot do better than refer to an admirable article which was written by Dr. H. J. Bush and appeared in THE CHEMICAL AGE for January 29 last. Reference should also be made to a paper which Messrs. E. Bury, A. Bury, Ollander, and Bainbridge read recently at a meeting of the Cleveland Institution of Engineers.

The Engineering Chemist

It has been remarked that during the war England was saved by her chemists and let down by her engineers, while Germany was saved by her engineers but let down by her chemists. Although this generalisation may be somewhat too severe and unjust, it has to be admitted that in this country at least there is as yet a not inconsiderable space to be bridged between what is euphemistically termed "pure" chemistry and its development as a works process. There have been various attempts to bridge this gulf in all industrial countries. In Germany the Technische Hochschule were forging ahead of the universities, the leaders of the "Grossindustrie" noted that the former provided a more adept type of chemist in the works; and, as a result, industrial funds found their way to the Hochschule laboratories. In America the State universities are occasionally—for political reasons, unfortunately—keenly alive to the industrial needs of the State. A ready response is found in the go-ahead manufacturing organisations, who send round representatives to collect men to study minor problems in their research laboratories during the summer months, thus inculcating in the youth a love of technical research, and offering an open road to an immediate small but adequate salary. In England the technical and various mining schools perform the function of educating chemical engineers, but frequently the absence of any definite scientific method is to be noted. The struggle is still raging as to whether chemists should be taught a little engineering or engineers a little chemistry; but the somewhat grandiose and therefore fascinating idea of having various types of full-sized technical plant in operation, and housed in one building, is no longer encouraged. Paper-making plants which fill the room with paper in a few minutes, or magnetic ore separators which require several tons of ore for a short run, are really not instructive, although they provide a valuable asset to an organisation which relies for its funds upon the impression produced upon visitors. Reasonably large-sized laboratory plant—built in technical materials instead of in glass—the study of industrial flow sheets, works visits, and contact with actual industry as a holiday course all find their uses.

All such institutions, however, cannot flourish unless pure scientific research is encouraged, as is witnessed by the various Technische Hochschulen in Germany. Again, the Massachusetts Institute of Technology and similar establishments in the United States annually accomplish much more and assist chemical industry to a greater degree in their study of the "pure" sciences than the various semi-commercial technical research institutions in that country accomplish in a decade. It is to be hoped that the British visitors who have attended the meeting of the Society of Chemical Industry in Canada this summer have found an opportunity for studying Canadian views on this problem. If so, they should be able to express some opinion as to how far the English universities have progressed in their attempt to cope with the situation, and what modifications, if any, could profitably be introduced to make these institutions national assets of even greater value than they are to-day.

Sir George Beilby's Book

Within recent years Sir George Beilby has been so prominently associated with problems surrounding the proper utilisation of fuel that one has been apt to forget his valuable connexion with experimental work in other and more remote fields. There must be few chemists—more especially those in daily contact with operations on a works scale—who have not visualised immense improvements in the fuel consuming methods of the future after scanning the Reports of the Fuel Research Board over which Sir George presides; but as a timely reminder of his technical versatility comes a new work dealing with the aggregation and flow of solids. Those who know the author will not be in the least surprised to find him admitting in his preface that the observations recorded in the volume filled all his "spare hours" most pleasantly for many years; but that his modesty nearly resulted in such a valuable description of original work remaining his own secret may be gathered from his confession that preparing the material for publication was the least attractive part of the work. Apparently, however, Sir Herbert Jackson represented to the author the fact that the more fundamental bearing of his results had not been recognised in quarters where it would have been of value, and quoted instances where new research was being carried out in apparent ignorance of the experimental evidence obtained and the conclusions reached by Sir George. The result is that we have a volume which, apart from any influence it may have on the study of current metallurgical problems, is enjoyable reading for all those who endeavour to keep abreast of scientific development, and even the extraordinary amount of information it contains can scarcely give the reader an adequate impression of the labour involved in arriving at the conclusions which are presented.

The Calendar

Oct. 4	Sheffield Association of Metallurgists and Metallurgical Chemists: "The Constitution of Chromium Steels." T. F. Russell. 7.30 p.m.	Royal Victoria Hotel Sheffield.
5	Chemical Industry Club: Sir William J. Pope, K.B.E., on his recent Canadian visit.	2, Whitehall Court, London.
6	Chemical Society: Ordinary Scientific Meeting. 8 p.m.	Burlington House, Piccadilly, London.
7	Society of Chemical Industry, Manchester Section: "The Disposal of Waste Liquors." 7 p.m. An Exhibition of Chemicals, Apparatus, Plant, &c., will be open from 2 p.m. until 10 p.m.	Textile Institute, 16, St. Mary's Parsonage, Manchester.
9-12	Société de Chimie Industrielle: Annual Meeting.	Conservatoire National des Arts et Metiers, Paris.
18	Hull Chemical and Engineering Society: "Wrapping Machinery." F. Glover. 7.30 p.m.	Wilberforce Café, Waterworks Street, Hull.

Books Received

A Text-Book of Qualitative Analysis of Inorganic Substances. By Sydney Alexander Kay. London: Gurney & Jackson. Pp. 80. 7s. 6d. net.

Forensic Chemistry. By A. Lucas. London: Edward Arnold & Co. Pp. 286. 15s. net.

Faraday Society's Discussion on Catalysis

Newer Theories of Chemical Action

On Wednesday the Faraday Society held a General Discussion on the subject of "Catalysis with Special Reference to Newer Theories of Chemical Action." We give below abstracts from two contributions to the discussion.

Chemical Reactions on Surfaces

By Irving Langmuir, D.Sc.

AFTER the discovery of the law of mass action, and its kinetic interpretation, it was at first taken for granted that the same principle would apply unaltered to heterogeneous reactions; that is, it was assumed that the reaction velocity of a substance in contact with a solid would be proportional to the concentration of one or more of the reacting substances. Subsequent work showed that other factors than the mere mass action effect were important in determining the velocity of these reactions.

It was shown by Noyes and Whitney* that the rate of solution of solid substances in liquids is often limited by the rate of diffusion of the dissolved substances away from the surfaces. At this surface, therefore, the solution remain practically saturated at all times.

Nernst extended this theory to cover heterogeneous reactions in general. He assumed that all solid surfaces were covered with adsorbed films, and that the reacting substances must diffuse through these films before coming in contact with the underlying metal or other substance, constituting the solid. He assumed that in general the rate of reaction was limited by this diffusion and that the reaction would be practically instantaneous if it were not for the adsorbed film.

Bodenstein and Fink† adopted the general features of this theory, but considered that the film varied in thickness, depending upon the partial pressure of the gases in contact with the solid. In this way they were able to account for cases where the reaction velocity is not proportional to the concentrations of the reacting substances. For example, it was found experimentally that the velocity of the oxidation of sulphur dioxide with a platinum catalyser, as in the "contact process," was inversely proportional to the square root of the pressure of the sulphur trioxide.

This has not proved to be a satisfactory general theory of catalytic action. Thus, there is no logical reason for assuming, in some reactions, that the adsorbed film is proportional to the square root of the pressure, while in other reactions it is proportional to the first power of the pressure. These theories of diffusion through films require the existence of films relatively thick in proportion to the dimensions of molecules, for we find experimentally that the reaction velocities can vary a thousand, if not a millionfold, in reactions where we have to account for this change by a variation in the thickness of a film. In such cases it would be necessary to have films so thick that we should be able to see them. Fink, however, measured the amount of SO_3 adsorbed by the platinum per unit area, and found it to be of the order of magnitude of a single layer of molecules. It is, then, hardly logical to assume that the thickness of this film can vary in proportion with the square root of the pressure for a wide range of pressures.

Existence of Very Stable Adsorbed Films

Experiments which the author began in 1912 showed that the effect of residual gases on the electron emission from heated tungsten filaments in vacuum was generally to decrease the emission, instead of to increase it. Oxygen, or traces of water vapour, had a really remarkable effect in decreasing the current. Thus, at temperatures of about 1900°K., the emission was decreased many thousandfold by pressures of oxygen as low as one bar (one dyne per square centimetre, or approximately 10^{-6} atmospheres). If did not seem possible that the oxygen could prevent the emission of the electrons unless it covered in some form the larger part of the surface. This film, however, must have been an extraordinarily stable one, to remain on a filament in such good vacuum at this high temperature. At temperatures even as low as 1000°K. no visible film is formed on the surface of tungsten by introducing oxygen, for the WO_3 which is produced distills off and leaves the surface apparently clean.

The chemical effects of this adsorbed oxygen film are as striking as the effects on the electron emission. If a tungsten filament is heated to 1500°K., or more, in pure, dry hydrogen at low pressure, the hydrogen is gradually dissociated into atoms and the atomic hydrogen is adsorbed by the glass walls of the vessel or reacts with any WO_3 which may previously have been distilled on to the bulb. The hydrogen pressure therefore gradually decreases. This effect is entirely prevented by minute traces of oxygen.

The oxygen film on the tungsten surface consists of oxygen in a form which cannot react with hydrogen even at 1500°. It certainly does not behave like a layer of either tungsten oxide or of highly compressed oxygen gas. Its chemical properties have been completely modified by its adsorption on the tungsten. The function of the oxygen in preventing the dissociation of the hydrogen is clearly that of a catalytic poison. This effect of the oxygen on tungsten is observed with several other reactions.

The remarkable stability of these oxygen films, as well as the complete change in the chemical properties of the oxygen, gives reason for believing that the surface is covered with individual oxygen atoms chemically combined with the underlying tungsten atoms. This film cannot be regarded as consisting of an oxide of tungsten, nor as atomic oxygen, in the sense in which we think of free oxygen atoms. The oxygen atoms are probably held to the surface by four pairs of electrons, just as the oxygen atom is held to the carbon atom in CO_2. The oxygen atoms are thus chemically saturated, but the tungsten atoms are not saturated, so that they are held by strong forces to the tungsten atoms that lie below them. This kind of structure is quite in accord with the conception of the structure of solids to which we are led by the work of the Braggs, on crystal structure.

Thickness of Adsorbed Films

The general opinion among colloid chemists and others who have worked with adsorption effects, at least up to a few years ago, seems to have been that adsorbed films were usually of a thickness of 100 to 1000 A. Such thick films cannot be regarded as the result of true adsorption, but can result only from condensation in capillary spaces in presence of nearly saturated vapours or are due to sorption or solution.

There is no good reason for believing that it is only at low pressures and high temperatures that adsorbed films are of monomolecular thickness. The effect of catalytic poisons (as studied, for example, by Faraday), surface tension effects, the lubricating properties of thin oil films, passivity phenomena in electrochemical actions, electrolytic overvoltage, &c., all point unmistakably to the existence at atmospheric pressure of stable films quite analogous to those observed in high vacuum and at high temperatures.

Another method of determining the thickness of surface films and proving that they are oriented in the surface, depends upon the use of Gibb's thermodynamic equation, giving the total amount of material adsorbed in the surface of a solution in terms of the change in the surface tension of the solution as the concentration of the solute is altered. By measuring the surface tension of solutions at various concentrations it is thus possible to determine the amount of material adsorbed per unit area. As the concentration is increased, the amount adsorbed increases and approaches a definite limit. The results show that in all such cases the maximum amount adsorbed corresponds to that in a monomolecular film.

Mechanism of Adsorption

When the adsorbed film of carbon monoxide on platinum gradually disappears, on heating the metal to 300 deg. in the highest vacuum, it is logical to look upon this as an evaporation process. When a filament of platinum, or tungsten, or other metal is heated to a sufficiently high temperature in vacuum the material evaporates. If the metal is placed in a uniformly heated enclosure, the evaporation from the surface—

* *Z. Physik. Chem.*, 23, 689 (1897).
† *Z. Physik. Chem.*, 60, 46 (1907).

which we may consider continues unchanged—will be gradually offset by the return of atoms of metal from the vapour which accumulates in the space. Finally, an equilibrium is reached in which the rate of condensation of the vapour is equal to the rate of evaporation.

If we can assume that all the atoms of the vapour which strike the surface of the metal condense on the first collision, we may calculate the rate of condensation from the vapour pressure by means of the kinetic theory of gases.

Mechanism of Chemical Reactions on Surfaces

The clean surface of a solid crystalline body must consist of atoms or molecules arranged in a surface lattice, or kind of checkerboard. Non-crystalline bodies, such as glass, must have surfaces in which the atoms are probably not in regular lattices. We may also have surfaces which are porous, or consist of irregular filamentary projections and interlocking chains of atoms or molecules. In such cases the extent of the surface cannot be defined, except in a purely arbitrary manner. Most finely divided catalysts, such as platinum black, or activated charcoal, &c., must have structures of great complexity, and it is probable that the atoms are attached to each other in the form of branching chains so that there are hardly any groups of as little as three or four atoms which are as closely packed as they would be in the crystalline solid.

In general, we should look upon the surface of a catalyst as consisting of a checkerboard in which some of the spaces are vacant, while others are filled with atoms or molecules. Some of these molecules, or atoms, may be so firmly attached that they do not evaporate at an appreciable rate. Others leave the surface from time to time, and the vacant spaces thus left are sooner or later filled by other molecules which strike the surface and condense.

In the presence of a gas which has a poisoning effect on a catalyst, the reaction velocity depends on that fraction of the surface which is not covered by molecules of this gas. If the temperature is high enough and the catalyst poison is of the kind that has a transient effect, the adsorbed molecules evaporate at a certain rate. If much of the gas is present, the vacant spaces thus produced tend to be refilled by these molecules. The fraction of the surface which is in an active condition is thus directly proportional to the rate of evaporation of the film, and inversely proportional to the partial pressure of the gas producing the poisoning effect. We are thus led to an understanding of the mechanism of the type of reaction which was explained by Bodenstein and Fink by assuming adsorbed films having a thickness varying in proportion to the pressure of a gas.

When gas molecules condense on a solid surface in such a way that they are held on the surface by primary valence forces, involving a rearrangement of their electrons, their chemical properties become completely modified. It is not surprising, therefore, that in some cases such adsorbed films should be extremely reactive, while in other cases they may be very inert to outside influences.

Cause of Surface Reaction

The reaction which takes place at the surface of a catalyst may occur by interaction between molecules or atoms adsorbed in adjacent spaces on the surface, or it may occur between an adsorbed film and the atoms of the underlying solid, or again, it may take place directly as a result of a collision between a gas molecule and an adsorbed molecule or atom on the surface. This third kind of action is perhaps indistinguishable from one in which the incident gas molecules condense on top of those already on the surface, and then react with them before they have a chance to evaporate.

In a surface of crystalline platinum, where the atoms are presumably arranged in a definite surface lattice, the distances between adsorbed atoms which occupy adjacent spaces is probably a nearly fixed quantity, and in general it is unlikely that this fortuitous spacing is the best adapted to the interaction between the adsorbed molecules. When the surface atoms have been pushed around and made to assume new positions, arranged more or less at random, the distances between adjacent adsorbed molecules vary over a wide range, and some of these distances will be exactly right for the reaction to occur at the highest possible speed. The surface thus becomes composite, and there is then a relatively small fraction of the surface at which the reaction occurs with extreme rapidity, while over the larger part of the surface it takes place at a very slow rate.

The Radiation Hypothesis

By W. C. M. McC. Lewis

The term catalysis as usually employed is a comprehensive one, including non-stoicheiometric effects as well as stoicheiometric. As examples of the latter we have reactions brought about by ions and molecules of solutes in homogeneous solutions: non-stoicheiometric catalysis being found in the influence of the solvent in the case of homogeneous solutions and by the surface of the material in heterogeneous systems.

The intermediate compound view of catalysis, which has been very generally accepted and for which there is considerable experimental evidence, is not a general theory of catalysis as a whole. It applies essentially to stoicheiometric catalysis with a possible extension to certain cases of heterogeneous catalysis in which it is difficult and perhaps unnecessary to draw a sharp line between adsorption and temporary chemical combination.

In the case of homogeneous systems the intermediate compound view affords an explanation of one aspect of catalysis, in so far, in fact, as the material mechanism of a process is concerned. It serves in short to bring catalytic reactions into precisely the same category as ordinary stoicheiometric processes to which we would not apply the term catalytic. It cannot do more than this. The further theoretical treatment of stoicheiometric catalysis becomes identical with the treatment which must be applied to non-catalytic processes.

The characteristic feature of positive catalysis is the usually enormous increase in velocity brought about by the presence of the catalyst. On the basis of the intermediate compound theory this is due to the formation of certain entities which, in the absence of the catalyst, are either not produced at all or at most in minute amounts. The increase in speed is directly attributed to the greatly increased concentration of reacting individuals. Whilst this is undoubtedly correct for stoicheiometric catalysis no similar treatment seems possible for non-stoicheiometric catalysis. The explanation of the latter type of catalysis cannot be found in material considerations alone; it is necessary to consider the energy changes which are involved as a preliminary to the material changes observed.

That absorption of radiation is the source of chemical change in general was pointed out several years ago by Professor Perrin. In particular Professor Perrin offered the first explanation of the mechanism of uni-molecular processes.* The same mode of treatment was independently applied to catalysis by the writer in 1914† thereby extending the significance of Marcelin's concept of the critical energy to reactions whether catalytic or non-catalytic. By introducing the Quantum Theory it is possible to deduce not only the empirical equation of Arrhenius, but also the Einstein law of the photochemical equivalent in a very simple manner.

Instead of making a somewhat cumbrous distinction between stoicheiometric and non-stoicheiometric effects we may state the matter thus:—

Intermediate compounds are formed in general; their nature and stability, as measured by their critical increments or energy of activation, vary with the nature of the solvent, being determined by the electro-magnetic properties (essentially the vibration frequencies of the valency electrons) of the solvent and solute concerned.

The most fundamental problem involved therefore in catalytic as well as non-catalytic processes is the mode whereby the energy necessary for the chemical change is communicated to the reactant unit. It is in this connexion that recourse has been had to the radiation hypothesis of chemical reactivity.

According to this hypothesis, in the case of thermal processes, the radiation which is necessarily present in virtue of the temperature of the system and which possesses a certain density for each wave-length region, furnishes the energy which is required for the chemical change. The absorption is considered to be continuous. This energy may either be communicated in terms of a single quantum corresponding to a given frequency or in terms of a small number of quanta of correspondingly lower frequency. It is important to observe that we are considering at the moment a single chemical process, such as the dissociation of a diatomic gas. This case is clearly different

* "Les Atomes," 1913.

† *Cf. Journ. Chem. Soc.*, 105, 2330 (1914); *ibid.* 107, 233 (1915).

from that met with in solutions in which a complex molecule is ruptured at more than one position. In this case the total increment is necessarily made up of a number of smaller increments.

The radiation hypothesis, based as it is upon the quantum theory of Planck, harmonises with views on atomic and molecular structure in which the quantum theory plays a fundamental part. Since Bohr in 1913 put forward his now familiar theory of atomic structure the concept of a given atom or molecule existing in a number of steady states which differ from one another in respect of energy has come to be generally accepted even by those who do not regard the particular distribution and modes of motion of the electrons as postulated by Bohr to be necessarily correct.

The radiation hypothesis has been criticised from three points of view. In the first place it has been criticised on the ground that the rate of supply of radiant energy of a given frequency and at the temperature of the matter is insufficent to account for the observed rate of the chmical process, even in the case of reactions carried out in an isothermal manner. This criticism is implicitly founded on the assumption, however, that the "original" amount of radiation of the frequency which the matter can absorb in the chemically active region is the only source of supply. It overlooks the adjustment already referred to, whereby the effective supply is the whole range of frequencies present in virtue of the temperature of the system, conversion from one type to another taking place by reflection and absorption and emission between the oscillators present in the system itself and the material surroundings, the thermostat or constant temperature furnace.

The second criticism is based on photo-chemical considerations, it being pointed out that the exposure of many systems to sunlight does not sensibly increase the observed velocity of the reaction, although in sunlight itself the radiation density corresponding to any frequency is very much greater than the corresponding density in the material system maintained at ordinary temperature. Since, however, the matter and radiation are in this case not at the same temperature it is unjustifiable to compare the relative effects at all.

The third criticism of the radiation hypothesis is that in certain cases, notably in gaseous reactions, at the position which corresponds to the critical increment of the process the substance possesses no absorption band when examined spectroscopically, *i.e.*, photo-chemically, and consequently is incapable of responding to radiation of this frequency under thermal conditions. This criticism appears to be justified and to involve therefore a certain modification of the radiation hypothesis, a modification already hinted at, namely, absorption at a frequency which is a submultiple of that calculated from the critical increment., The calculation of the active frequency or wave-length from the kinetics of the chemical process is based on the simplest possible assumption, namely, that one quantum of the given frequency decomposes or activates one molecule to the extent required for the process. This is in fact Einstein's law of the photochemical equivalent. It would seem necessary to conclude that in certain cases a limited number of quanta of smaller magnitude take the place of the single quantum, the wave-length, corresponding to the smaller quanta, occurring naturally further towards the infra-red.

Physically there is a clear distinction between the continuous absorption of radiant energy until a single quantum of relatively high grade type has been accumulated and the absorption of the same amount of energy of relatively low grade type, in terms of a limited number of quanta of the latter type. In spite of this physical distinction, however, the final expressions obtained for the velocity constant of a unimolecular process are very similar and of the same order of magnitude. On reviewing the problems presented by chemical kinetics in homogeneous systems, both liquid and gaseous, one is led to regard the radiation hypothesis as in general a useful guide in the further elucidation of such problems.

The Disposal and Liquidation Commission announces that Sir Howard Frank has signed a contract for the sale to the British Metal Corporation, Ltd., of the whole of the BRASS SCRAP in Great Britain belonging to the Government. The purchase price is expected to work out at approximately £4,000,000.

Radium from Czecho-Slovakia

To be Used for Research in England

PROFESSOR SODDY, of Oxford University, arrived in England on September 25, carrying two grammes of radium, the largest amount that has ever been transported. The professor carried the precious mineral in a special packing of lead, 3 in. thick, which was wrapped in an official Foreign Office bag. "The radium has been acquired," he said to a Press representative on his arrival, "by the Imperial Foreign Corporation of London, for whom I am scientific adviser. It has been rented by the Corporation from the Czecho-Slovakia State Mines for a period of 15 years. At the end of that time it may be returned. The Corporation will in turn rent it to people in this country, scientists and others, who have special use for the radium. I went out to Czecho-Slovakia for a holiday, and had no intention then of bringing back the radium. I visited the Joachimsthal pitchblende deposits, where I was given every facility for seeing, not only the mines, but the process of taking over the radium. This process in future may be improved. When the negotiations for the hiring of the radium were settled, the director of the factory, Herr Hummel, and myself attended at the Ministry of Public Works, where the radium was opened out.

"Our plans with regard to the radium, which is deposited in a safe in London, are uncertain. I shall probably take it to Oxford, where I hope there will be an opportunity of establishing a research laboratory, though reports that this laboratory has already been decided upon are quite unfounded. Naturally we are all very pleased at being able to procure our two grammes of radium. It will be of enormous help in scientific research. Hitherto our great difficulty has been that we have never had enough to work with."

Affairs of a Chemical Engineer

AT the Hereford Bankruptcy Court recently, before Mr. F. R. James, Registrar, Mr. James Findlay, D.Sc., of Bromsash House, near Ross, attended for his first public examination. His gross liabilities amounted to £3,896, all of which was due to six unsecured creditors, and his assets were estimated at £1,500, leaving a deficiency of £2,396. He attributed his insolvency to having become involved in the Wig Pool Mine, Forest of Dean, and to the present slump in the textile trade, rendering his shares in the Wool Fibre Company less valuable.

Replying to questions put by the Official Receiver, the debtor said he was a chemical engineer and in 1916, when his present debts were contracted, he was carrying on business in the Strand, as a consultant. He commenced business as a chemical engineer, in Fenchurch Street, in 1888.

In 1913 he came in contact with a syndicate, and was employed by them in advising as to the working of the Wig Pool Mine in the Forest of Dean. The mine, however, was shut down in 1914. The next year the debtor was approached by all the persons interested, who ultimately arranged to find the necessary capital to carry on development, and this he did till the end of 1915, when the mine was closed. Some of the parties concerned and the debtor became possessed of the mine, which was held under a Crown lease, and they were to find the money, but did not do so after June, 1916, when he (the debtor) was left to carry it on. This he did by borrowing £600 from the petitioning creditor and providing cash out of his own earnings as an engineer. Ten thousand pounds was found by a Manchester solicitor for working capital and development in October, 1916, but he (the debtor) was not repaid the £600 and cash advanced. Disagreements arose, and the Manchester solicitor obtained payment of £4,000 or £5,000, the balance of his £10,000. The debtor and others interested were held liable to the Manchester solicitor for the balance of the £10,000 not paid. Soon afterwards the mine was sold, but he could not give any particulars as to the sale. All his debts, excepting £446, were due in connexion with the Wig Pool mine.

The examination was adjourned.

According to a cabled report from Melbourne, the sulphuric acid works of the BROKEN HILL PROPRIETARY CO., LTD., at Broken Hill, were restarted on September 9. Work was also recommenced three days later at the slimes flotation plant.

The Society of Chemical Industry

Some further Notes on the Montreal Meeting

Exclusive Reports and Abstracts of papers read at the Annual Meeting of the Society of Chemical Industry in Montreal have appeared in previous issues of THE CHEMICAL AGE. *This week we give some further impressions by "L. A. J."*

The Montreal Meeting and After

By "L. A. J."

NEW YORK, September 9.

IT is generally agreed that the Annual Meeting of the Society of Chemical Industry, which has just been held at Montreal, has been an unqualified success.

The meetings were attended by upwards of 300 members from all parts of the world, and attention has been directed upon the fact that this society is not the British nor the American, but *The* Society of Chemical Industry; in this fact lies its strength.

The papers read—all prepared by Canadians with one exception—were well received and provoked considerable discussion, which speaks well for their value. One need hardly say also that the President guided the business with his customary skill, and I know that I am but voicing Canadian sentiment in saying that Sir William Pope has delighted his hosts and so contributed greatly to the general enjoyment.

After this year and more particularly perhaps after Dr. Ruttan, the first Canadian president, has served his term of office, Canadian chemistry will never be quite the same. Sooner or later great developments in all branches of chemical activity in Canada must come, and many think that this visit will stimulate chemical thought in Canada at just the right time. As in all other countries at present, business is bad and some firms are having severely to reduce the organisations, but on the whole Canadians are not worrying too much about it. They are tidying up their minds, and thinking hard.

The development of the "dollar" habit, evidently a feature of modern business life which has swept over the border, without perhaps our friends the Canadians knowing it, tends to the neglect of anything but the dollar and to things which in the strictest sense may be described as more fundamentally important than the dollar. The "dollar" habit has also its good points, for the Canadians have got the "keep her going" idea well home, and chemistry—at any rate, the recognition of its place in industry—never wanted to be kept going more than now.

Chemical Industry of Canada

There is no doubt that great disorganisation prevails in the Canadian chemical industry to-day. The factories at Shawinigan (which to an English mind has come to be the very personification of Canadian chemical industry) are like monuments to things of a dead past. The silence is disturbing and oppressive. And yet at Shawinigan, with its development of hydro-electric power even now rivalling that of Niagara, extensions to the power plant are in hand on a large scale.

The extensions to the power plants of Canada are evident everywhere, and one of the greatest of these developments is the Chippewa Power scheme of the Ontario Government at Niagara Falls. This is a stupendous work, involving the diversion of the Chippewa river and the construction of a hydraulic canal nine miles long which must be cut through rock. The inflow to the canal being well above the rapids an effective head of 300 ft. of water is to be obtained, whereas the drop over the falls proper is but 168 ft. The capacity of this one station, to be working next year, will be 500,000 H.P., bringing the total power development at Niagara (American and Canadian) to 1,000,000 H.P.

There is another point about the water power development in this region. We at home depend upon coal for power, but we sometimes forget that we are consuming capital. The water power consumer, on the other hand, merely lives on income, and given the necessary apparatus there is no reason why these power development schemes should not run on for ever.

At the present time power is distributed over a radius of something like 300 miles, and we cannot place any limit upon the possibilities of power distribution in the future. But as naturally the power costs least in the immediate neighbourhood, so will industry tend to concentrate in the Falls area. There is the power, the medium for doing your work. What is going to be done with Canada's strength? Is it going to be used? And who is going to use it? Is it to be the Britisher or the American? Canada wants an answer and soon.

Now it may not be fully appreciated at home how intensely British Canadians are—in fact, it may be said sorrowfully, but with some truth more British than many Britishers. It may be that distance lends enchantment to the view when they think of the Old Country, but the fact remains and it is very important.

British Capital Wanted

Canada wants capital and she wants British capital, and capable British men (with the repute of established British firms behind them) to look after that money. Canada wants new industries, but British industries and men of British birth to run them.

The business is there and the British business man has only to reach out for it to have it. Sentiment is on his side and provided that he can fulfil Canadian requirements as expressed by Canadian judgment there is no more to be said. The alternative is that he can get anything, stock or spare parts, by return from New York only a few hours away.

United States Competition

Anyway, the Americans are after the business and they are getting it. They realise the enormous possibilities of Canada. American money is pouring into the country. New York is within a few hours of Montreal and Toronto and is always considerately ready to supply Canada's needs. The Britisher has got to be able to do the same—he must put stock into the country.

British business men generally should consider very carefully whether they understand Canada's possibilities, her requirements and her temperament.

Those with business connexions in Canada should consider carefully whether they are doing all they can, and whether their interests, if in other hands, are being fostered. And in dealing with Canada all *Britishers* should remember the lines:

> Canada—"Daughter in her mother's house,
> But mistress in her own,"

and that they have to their hands a weapon which others have not—"sentiment."

The press of social functions continued right to the end, and at the finish very few of the party were in anything like condition to be handed over to the tender mercies of our American hosts, who were all fresh and ready for the fray.

It must be recorded that the Convocation for the ceremony of conferring upon Sir William Pope the degree of Doctor of Laws was a very brilliant occasion. The Convocation was followed by a garden party (at which academic dress was worn), the hostess being Lady Borden. The proceedings in Montreal terminated at the Art Gallery with a lecture by Sir William Pope on "Cambridge University and Town" (illustrated), under the auspices of the Art Society. A very large and distinguished assembly filled the hall.

Then followed three nights in succession on the train, and an American sleeper is an experience! The intervening days were filled up at Grandmere, where we saw the new high-speed paper machines for newsprint working at the rate of 1,000 ft. per minute at the works of the Laurentide Paper Co.

Silent Shawinigan

As I have previously remarked, a great silence prevailed at Shawinigan, but nevertheless the visits were very interesting; most of us saw a carbide furnace being discharged. A great deal of interest was evinced in an electric boiler which was designed and erected by Mr. Kaelin, the Chief Engineer.

At Ottawa Mr. Hambly and his committee entertained the party right royally to lunch at the Rivermead Golf Club, and to dinner at the Château Laurier. The Minister of Labour—the Hon. Gideon Robertson—gave an interesting address at the dinner. In the afternoon the party visited the plant of the British American Nickel Co. and the Experimental Farm.

At Toronto, a delightful companion during the whole tour from Quebec, Mr. M. L. Davies, came into his own. He is the chairman of the Toronto section and so he found plenty to do his bidding.

We were entertained at the Canadian National Exhibition by Mr. Fleming, chairman of the directors Mr. Gibson, the Deputy Minister of Mines, and Mr. Ellis, the chairman of the Power Development Commission.

Everyone greatly enjoyed the trip around the harbour on the steam yacht, *Bethalma*, the property of the Harbour Commissioners.

On the following day many paid toll to the Lake Ontario, and so we came to Niagara and the States.

Canada—*au revoir!*

The American Visit

S.S. "Celtic," September 15.

The visit to the American section of the S.C.I., and to the American Chemical Society, started officially at Niagara Falls, N.Y., when the party were received by General Kincaid, representing Governor Miller of New York State. General Kincaid offered, on behalf of Governor Miller, the Freedom of the State, which Sir William Pope tastefully accepted. Dr. W. H. Nichols, Dr. Edgar Smith, Mr. S. R. Church and Mr. Hooker, representing the Societies, also bade us welcome.

Buffalo was reached in time to take a very pleasant ride around the city, and preceded by police outriders on motor-cycles we enjoyed something akin to a royal progress.

Later in the evening, at dinner at the University Club, it was pointed out that the citizens of Buffalo owe their beautiful city to an entirely British scheme, for had not the old town been destroyed utterly in the fighting of 1813, it is hardly likely that the city would have its present form, or even the wonderful park system of which the city is so proud.

After yet another night "on the shelf" in an American sleeper we reached the works of the Solvay Process Co. (General Chemical Co.), of Syracuse. Here the directors entertained us, and threw open their plant for inspection, a thing which was entirely without precedent at these works. The nitrogen products section of the works, dealing with the manufacture of synthetic ammonia by a process generally akin to the Haber process, was not visited, but we understood that there have recently been made developments which place the process well to the fore. In fact Dr. Nichols in a speech stated as his considered opinion that the nitrogen fixation problem was now completely solved.

From Syracuse, New York was reached *via* Albany, and a trip down the Hudson River. On the morning of arrival in New York a luncheon was given at the Pennsylvania Hotel which was the last meeting of the Society of Chemical Industry as such. From that time we became the guests of the American Chemical Society.

The New President

Dr. Ruttan, as the new president of the Society, can be trusted to develop the work of the Society in Canada especially, and among the newly-formed sections and those which will be formed in the near future. To those Englishmen who have not known Dr. Ruttan personally it is sufficient to say that his selection for the Presidency by Canada was unanimous and yet obvious, for above all he is a man—and a man with personality.

He is beloved and respected by his students, and there are sufficient of them scattered throughout North America to carry Dr. Ruttan through anything. On the other hand, he is not frigidly academic; not only is it well-nigh impossible for a man of his rank to remain aloof from industry and its problems in Canada (such is not permitted), but Dr. Ruttan seeks to help Chemical industry as is shown by his great work in securing the foundations of the National Industrial Research Council.

The Society of Chemical Industry is safe in his hands!

Next year Dr. Ruttan will preside at Glasgow, and we shall look forward to meeting many Canadian and American members at that meeting.

We can wish them nothing better than to hope that they will spend as pleasant a time with us as we have with them.

L. A. J.

"Ancient Order of Trismegistians"

Presentation to New President

Before leaving Montreal the United Kingdom and other European delegates entertained their hosts to a dinner of the newly formed "Ancient Order of Trismegistians." The ritual, which was of a novel description, included the presentation to Dr. R. F. Ruttan of an "illuminated address" and a "piece of plate."

The former consisted of a card enclosed in a silver frame, specially illuminated for the occasion by an electric torch, and bearing the inscription, "Dr. R. F. Ruttan, Society of Comical Industry, Sensible House, Fairand Square, London." The "piece of plate" was literally a fragment of a dinner-plate in a handsome case.

Returning thanks, Dr. Ruttan delighted his hearers with a song, and this and other items contributed to a happy and thoroughly enjoyable evening.

The Multiple Engineer

Every conceivable branch of chemistry is firmly established and has a literature of its own, except one—Jocular Chemistry. This rich field is being exploited by those who (in America) are said to have put the Nose in Diagnose, by whose permission this song is reprinted.

Who is the man designs our cars with judgment, skill and care?
Who leaves it to the service man to keep them in repair?
Who estimates their useful life at just about a year?
The bearing-wearing, gearing-tearing auto engineer!

Who is it takes a transit out to find a sewer to tap?
Who then with care extreme locates the junction on the map?
Who is it goes to dig it up and finds it nowhere near?
The mud-bespattered, torn and tattered civil engineer!

Who thinks without his product we would all be in the lurch?
Who has a heathen idol which he designates Research?
Who tints the creeks, perfumes the air, and makes the landscape drear?
The stink-evolving, gas-dissolving chemical engineer!

Who is the man who'll draw a plan for anything you desire—
From a transatlantic liner to a hair-pin made of wire?
With "ifs" and "ands," "howevers" and "buts" who makes his meaning clear?
The work-disdaining, fee-retaining consulting engineer!

Who builds a road for fifty years that disappears in two?
Then changes his identity so no one's left to sue?
Who sprinkles all the travelled roads with filthy oily smear?
The bump-providing, rough-on-riding highway engineer!

Who penalises zinc and steals his silver and his lead?
Who is it that the farmer likes to bang upon the head?
Who poisons every living thing that happens to be near?
The sulphur-belching, miner-welching smelter engineer!

Who is the man who views the rivers and promptly turns them down?
Who is the one who thinks this is the short cut to renown?
Who is it gives the bum advice to the innocent financier?
The knowledge-feigning, theory-straining mining engineer!

Who takes the pleasure out of life and makes existence hell?
Who'll fire a real good-looking one because she cannot spell?
Who substitutes a dictaphone for coral-tinted ear?
The penny-chasing, dollar-wasting efficiency engineer!

[Sung at the Society of Chemical Industry dinner, University Club, Buffalo, N.Y. 1921.]

THE LAVENDER DISTILLING PLANT established by Schimmel & Co., Leipzig, at Barreme, France, about fifteen years ago and which was sequestrated by the French Government during the war, is reported to have been sold to J. Gras, Cannes, France. Mr. Gras is engaged in the distillation of essential oils, and before the war was manager at Barreme for Schimmel & Co.

Annual Meeting of the American Chemical Society

International Gathering at New York

The sixty-second meeting of the American Chemical Society, held at Columbia University from September 7 to 10, was of an international character owing to the attendance there of delegates from the Society of Chemical Industry. We give below abstracts of a number of the papers read during the meeting.

Industrial and Engineering Section

New Method of Preparing Sulphuric Acid

The following is an abstract of a paper by P. C. Haeseler on a New Method of Preparing Sulphuric Acid: Instead of oxidising SO_2 with the oxide of nitrogen, selenium dioxide is used according to the equation:

$$2SO_2+H_2O+H_2SeO_3=2H_2SO_4+Se$$

The selenium is filtered and reoxidised. A 50 per cent. sulphuric acid free of selenium can thus be obtained without pressure. Anode slimes and other impure selenium sources can be used for the source of selenium, as roasting the same will yield an oxide sufficiently pure for the above reaction.

Formation of Oxides of Nitrogen in Gas Analysis

Results of investigations showing the amounts of oxides of nitrogen formed when gases are analysed by the slow combustion and explosion methods were given by G. W. Jones and W. L. Parker.

The following conclusions were obtained: The production of oxides of nitrogen by the slow-combustion method when the time of burning is not more than three minutes and the wire heated to a bright yellow is within the experimental error in routine gas analysis. Under the above conditions not more than 0·003 c.c. of oxides of nitrogen were produced. No oxides of nitrogen were produced by the explosion method when air was used as the oxygen supply.

When mixtures of air and oxygen were used as the oxygen supply in the explosion method appreciable quantities of oxides of nitrogen were produced, which are too large to be disregarded in gas analysis.

The method used for determining the quantity of oxides of nitrogen produced was a modification of the di-phenol sulphonic acid method as used in water analysis.

Medicinal Section

Effect of Glass on Hydrogen Peroxide

The deterioration of hydrogen peroxide was attributed by Dr. Paul Poetschke to the use of an inferior quality of glass container.

Carefully conducted experiments confirmed the fact that traces of alkali dissolved in glass bottles caused rapid deterioration of hydrogen peroxide. Manufacturers in the United States had not given sufficient attention to the selection of glass bottles of suitable quality for bottling hydrogen peroxide, with the result that undue deterioration had been charged frequently to impurities in the hydrogen peroxide when defective glass was responsible.

Experiments made by storing hydrogen peroxide in the dark and in vari-coloured light showed that solutions kept infinitely better if stored in the dark. Orange and red lights afforded some protection over white light whereas blue light caused the greatest deterioration.

Dr. Poetschke stated that such preservatives as acetanilid and quinine sulphate retarded decomposition, but that all preservatives were less effective than storage in bottles of suitable quality and the exclusion of light.

Toxicity of Benzyl Alcohol and Its Homologues

In the course of his paper Oliver Kamm said the acute toxicities towards paramecia of homologues of benzyl alcohol agreed well with the values predicted on the basis of experimental results obtained with aliphatic alcohols. Given the experimental value for one straight chain aliphatic alcohol, the toxicities of the remaining members could be calculated by means of the "rule of thirds." The common branched-chain members also fitted into the prediction scheme, two methyl groups in the form of side-chains being equivalent to one additional carbon atom in a straight-chain. To predict toxicities in the benzyl series it was simply necessary to apply in addition the previously presented "molecular volume relationship."

Physics and Inorganic Section

Diffusion of Hydrogen through Metals

H. G. Deming and B. C. Hendricks, in their paper on "The Diffusion of Hydrogen through Metals," described how sheet metal of 0·15 mm. thickness was clamped between two heavy steel blocks in an electric furnace, the diffusion area being circumscribed on the face of each block by a pair of concentric knife-edges. The channel between the knife-edges in the block on the incoming side was connected to a vacuum pump; on the outgoing side to compressed nitrogen. The diffusion was thus limited to a definite area of metal of perfectly uniform temperature, even though the blocks were never pressed against the metal tight enough to make a gas-tight joint. They found that aluminium is impervious to hydrogen up to its melting point. The authors obtained quantitative data for copper, iron and other metals.

High Frequency Ozone Production

To eliminate the dielectric, which is the greatest weakness with commercial ozonisers, advantage was taken by F. O. Anderegg of the fact that it is impossible to maintain a high-frequency arc. An aluminium tube 5 × 190 cm., with a concentric wire, was used for the discharge. Current was supplied up to half an ampere and 7,000 volts at about a million and a half cycles frequency by a small Tesla coil, which was designed so as to give the best discharge with the tube used. The highest yields were secured with a rather large wire provided with numerous small points, so that the discharge should be made up of many brushes. The ozonised air contained but small amounts of nitrous oxides, although on raising the voltage till the discharge was filled with sparks, about 0·02 per cent. was obtained. Numerous curves have been worked out showing the relationship between the different variables, which are usually similar to those obtained in low-frequency ozone production.

Organic Chemistry Section

Olefines in the Preparation of Alkyl Phenols

In their preliminary report on the above subject, C. E. Boord, A. J. Yaney and C. W. Holl described a simple apparatus for the laboratory preparation of ethylene, propylene, butylene and amylene. A description of the preparation of anylphenol and amyl catechol by the interaction of amylens and the phenol in the presence of anhydrous ferric chloride was also given. An extension of the reaction between olefines and phenols in the presence of anhydrous chlorides for the preparation of alkyl phenols was proposed. It was also proposed to use this reaction in a study of the mechanism of the Friedel-Craft's reaction.

Compound Formation in Phenol-Cresol Mixtures

The isolation of stable compounds between phenol and the cresols has been cited by Dawson and Mountford as constituting an exception to the generalisation that the stability of addition compounds decreases with increasing similarity in character of the components. J. Kendall and J. J. Beaver, in a paper on the above subject, said they had determined the specific conductivity, viscosity and freezing-point depression curves in benzene for all the phenol-cresol systems. Without exception, the results indicated that no increase in molecular complexity occurred on admixture. The compounds obtained by Dawson and Mountford were, therefore, to be regarded as substitution rather than as addition compounds, being formed by the replacement of part of an associated molecule by a homologue.

Preparation of Absolute Alcohol

In dealing with the above subject, W. A. Noyes said that although Beilstein contained a statement that alcohol was dehydrated commercially by means of calcium chloride, he had been unable to find any other reference to the matter in literature. A careful study of the subject had brought out

the following: From strong alcohol containing somewhat more than one molecule of calcium chloride for each molecule of water present, alcohol of 99 per cent., or stronger, could be distilled. On concentrating such a solution a solid alcoholate (not a hydrate) separated, and there was an equilibrium between the alcoholate and the hydrate present. A quite high temperature was required to expel the alcohol from this solid, but if enough water was added so that about 5 molecules were present for each molecule of calcium chloride, the alcohol could be distilled away completely at a temperature below 140°. The hydrate of calcium chloride which remained was liquid at 100° or above, but solidified at ordinary temperatures.

On the basis of the facts given, 99 per cent. alcohol could be prepared, by means of calcium chloride, without loss of alcohol. The remainder of the water could then be removed by lime or by some other method.

Dyestuffs Section

Qualitative and Quantitative Evaluation of Dyestuffs

IN the course of a paper on the above subject, Robert E. Rose said that determining the value of dyestuffs was an art as complex as that of the gem expert.

The dye tester must compare different colours so closely as to be able to tell the difference, produced by 1/32 of an ounce of colour in 100 lb. of material. He must do this on a small sample weighing from 1-14 to ½ of an ounce; he thus actually saw the difference produced by adding or subtracting 1-10,000,000 of an ounce of that dyestuff in the field of vision.

In the matter of shade he must be more particular than the most stylish woman. He must check one lot of dyes against another and not pass any two that varied perceptibly to the ordinary eye; he must be ready to match colours just as exactly. All this he did by very careful observation and very precise weighing of the quantity used.

Fastness of Dyes

Oscar R. Flynn read a paper on the "Fastness of Dyes to Storage," in which he said that dyed cotton goods sometimes changed unevenly when stored in the folded piece. Regions of change marked out the channels along which air flowed due to changes in temperature. This showed that the change in the dye was caused by some substance present in the air in small quantities and not primarily to oxidation, which showed its effect in the interior of a mass of goods.

In some cases the change was temporary, and the result of the action of acid alone. In other cases the effect was due in the first place to acid, but followed later by complete destruction of the dye.

Alkali sensitive dyes such as stilbene yellow showed temporary changes due to acid alone. Acid sensitive dyes, such as Congo Red, showed permanent change due to fading after actions of acid.

When alkalis were used in finishing, enough should be used to last a year or more. Alkali sensitive dyes should be finished in the acid condition.

Synthesis of Anthraquinone

In a paper on "The Synthesis of Anthraquinone from Phthalic Anhydride and Benzene," E. R. Harding made an extensive study of the Friedel Crafts reaction for the preparation of ortho benzoyl benzoic acid. He found that phthalic anhydride reacted with benzene and alumium chloride to give an unstable intermediate compound which was easily decomposed to give a salt of benzoyl benzoic acid. This acid was readily converted to anthraquinone by heating with sulphuric acid. The yields throughout were good. The process was commercially attractive because the raw materials were abundant and comparatively cheap. Anthraquinone produced from anthracene so far had been expensive on account of the cost of anthracene, the removal of which from tar left a pitch of low value.

Preparation of Amino-Phenol-Sulphonic Acid

J. R. Minevitch, in his paper on the "Preparation of Amino-Phenol-Sulphonic Acid by the Chlorbenzol Method," said that amino-phenol-sulphonic acid (2:1:4) was best prepared by reducing the corresponding nitro-phenol-sulphonic acid with either acid or alkali reducing agents, according to the medium in which the nitro body was last obtained. A successful manufacturing process would, therefore, largely be based upon the ease with which the nitro compound could be produced in large quantities.

There were, he said, four other possible methods for its manufacture, but the chlorbenzene process gave the highest yield and at a vastly cheaper cost.

Rubber Section

Mineral Rubber: A New Compounding Ingredient

New uses for a substance called mineral rubber were detailed by C. O. North.

Mineral rubber, or MR, as it was more commonly known, derived its name from the fact that it was formerly prepared by blending natural asphalt with a harder bitumen such as gilsenite. To-day it was largely manufactured by heating to a high tempetature while blowing with air, a mixture of gilsenite and still residue from the distillation of Mexican or Oklahoma petroleums.

Unvulcanised rubber was largely plastic, with little elasticity, and vulcanised rubber was chiefly elastic and slightly plastic. Mineral rubber, however, was plastic both before and after vulcanisation.

Mineral rubber was not a rubber substitute nor an adulterant of rubber goods. It is strictly a compounding ingredient. When properly used it increased the life and service of the articles containing it.

When a vulcanised compound containing mineral rubber was stretched, the MR flowed out with the rubber and was pulled back by it on release. Consequently as much as 40 per cent. of MR by volume might be added to rubber without greatly affecting its tensile strength or the limit to which it could be stretched. If these were the only factors MR would be very extensively employed. Unfortunately, it had no toughening properties, such as were imparted by gas black or zinc oxide. When used in excess of 15 per cent. by volume it slowed up the recovery of compounds containing it. This property was known as logginess or laziness, and was due to the slow flow of MR when pulled back by the rubber on contraction.

The properties of mineral rubber could be altered by using different materials and methods of preparation. If MR could be prepared without the excessive plasticity of the present material it would be employed more extensively and in larger amounts than was possible to-day.

Petroleum Section

Characteristics of Crude Petroleum Emulsions

Eugene E. Ayres, Jr., in presenting his paper, said the enormous waste of crude petroleum on account of its mixture with water has been caused by a misunderstanding of the nature of the mixtures. Crude petroleum emulsions had been regarded as possessing too few common characteristics to make possible any recovery process of general application.

As a matter of fact, crude petroleum emulsions as they occurred industrially showed an unexpected sameness. Moreover, the emulsions were among the least stable of industrial emulsions, and there were several successful processes for their separation on a large scale.

When water was agitated with crude petroleum the water was broken up into small globules which were suspended in the oil. For any method of separation of such emulsions it was necessary to move the globules together to leave the bulk of the oil free from water, and then to coalesce the globules to form a layer of continuous water.

Gravity was the force most generally used to move the globules down. Gravity could do as much and as good work on these emulsions as any other force, if we gave gravity sufficient time. But the modern centrifugal plants generated a force from 15 to 18 thousand times as great as gravity, and the time of settling might thereby be reduced to one fifteen-thousandth of the time required by gravity. Centrifugal force and gravity would cause the globules to coalesce when the emulsions were heated. Gravity, when correctly used, would resolve some crude petroleum emulsions rapidly enough for practical purposes. But centrifugal force when correctly applied would resolve any crude petroleum emulsion at a profitable rate.

It was often desirable, however, to increase the rate at which the more stable of these emulsions might be handled by

gravity or by centrifugal force. The larger the water globule, the more easily could it be moved and caused to coalesce with other globules. There were many ways of causing groups of small globules to unite to form single larger globules.

One method that was negligable in cost and invariable in result was to add to the emulsion a small percentage of a material soluble in petroleum but containing a substance classified as a "water-soluble protective colloid." Such a substance was starch, which, normally insoluble in oil, could be combined with intermediate substances in such a way as to become apparently soluble in oil.

Emulsifying Agents

A paper by J. L. Sherrick on "Emulsifying Agents in Oil Field Emulsions," pointed out that the presence of some third component, usually a colloid, to serve as an emulsifying agent, was recognised by most workers as a necessary condition for stable emulsion formation. Experimental results indicated that earthy matter, carrying absorbed asphalt, asphaltenes, &c., and present in the oil as a hydrophobe colloid, acted as the emulsifying agent in oil-field emulsions. This conclusion was in line with Richardson's work on Trinidad asphalt.

The addition of certain organic solvents decreased the absorption of asphalt on the earthy material and rendered these emulsions unstable. As the absorbed asphalt was removed the earthy matter ceased to be a hydrophobe colloid such as was necessary for the stabilisation of a water-in-oil emulsion.

Fertiliser Section

Briquetting of Mineral Phosphates

In connexion with the research work being conducted by the United States Bureau of Soils on the volatilisation of phosphoric acid in a fuel-fed furnace, experiments were undertaken by William H. Waggaman and H. W. Kasterwood to determine how widely applicable this method would be in handling run-of-mine phosphate from the more important phosphate areas. Preliminary work had shown that the briquetting of these phosphates was a factor of prime importance, and therefore a number of problems incident to briquetting were investigated.

Samples from old phosphate deposits which are now being reworked were found to be sufficiently high grade, and contained enough natural binder to lend themselves to briquetting purposes. Also much disintegrated phosphate rock and the detritus from the waste heaps could also be used. It was found that it was only necessary to reduce the material for briquetting purposes to a point where it would pass a ten-mesh sieve.

Two methods of incorporating the necessary water into the mixture to give it the required plasticity were found satisfactory, the first being to spray or atomise it while the mass was being continuously mixed. Second, where the composition of the material was such that a considerable quantity of sand must be added to obtain the proper relation between lime and silicon in the charge, it was found that the necessary water could be added to the sand and coke; this moistened mixture was then incorporated with the phosphate material. An average of 10 per cent. of water was found satisfactory when the briquettes were made under a pressure of 2,500 lb. to the square inch.

Coal presented a very promising possibility as a reducing agent in such briquettes, since the volatile matter contained therein did not cause the briquettes to split open or disintegrate when heated.

Actual furnace tests with large quantities of briquetted phosphates were being planned to determine how widely applicable the furnace process of producing phosphoric acid would be to the Florida and Tennessee phosphates.

A Tokio message states that the JAPAN DYESTUFF CO. has succeeded in producing a few additional kinds of dyes, including scarlet for silk, water blue, pure indigo, acid brilliant red, and direct black 300 per cent. The last named is claimed to be better than the American product and equal to the German. Moreover, the cost of production is said to be much less than in America. These dyes will be put on sale shortly. Since the company was established it has produced about 100 different kinds of dyes, of which 40 are already on the market.

Russian Scientists' Plight

Experiences of a Professor of Chemistry

DR. J. W. MELLOR, of Stoke-on-Trent, communicates to *Nature* a letter received from a well-known Russian professor of chemistry. In view of the paucity of our knowledge of Russian affairs at the present time the following extracts from his letter are of interest :—

"You doubtless know the old adage, '*Primo vivere, deinde philosophari.*' I do this last, but the first part, '*vivere,*' is more than uncertain for us who have the misfortune to be a little civilised, as one never knows what our wild, wild taskmasters are going to do next. The higher schools of Petrograd are under the control of a former apprentice of the dockyards of Cronstadt, who has learned to talk glibly and to sign his name with an appropriate flourish. He has not the remotest notions as to what is a seat of high learning.

"Up to now we receive a 'ration of scientists,' which during 1920 was comparatively good, but is now reduced to the following items, received, for instance, in June :—14 lb. of bread (made principally out of soya beans); 11 lb. of soya beans (it is not generally known that they contain poisonous constituents, and many were the cases of poisoning); 19 lb. of herrings; 4 lb. of tallow (the first fatty substance received since February); 9 lb. of wheat (we eat it boiled in the form of gruel); 3 lb. of macaroni made out of soya beans; 1 lb. of salt; 1½ lb. of sugar; 3 lb. of lean pork—bones and hide, no lard, and very little meat; ¼ lb. of tea (surrogat); ¾ lb. of tobacco; some matches; and 1 lb. of washing soda (there is no soap). During the same month I received—only a few days ago—as salary for my lectures, etc., the stately sum of 21,000 roubles; but as bread costs about 4,000 roubles and butter 30,000 roubles per lb., this sum is the equivalent of 5 lb. of bread, or some 20 kopeks (=5d.) of pre-war days. You will thus appreciate the munificence of my salary; the meanest mechanic or plumber gets from 250,000 to 500,000 roubles and more monthly, and it is nothing unusual to pay 1 lb. of bread or 5,000 roubles for one hour of manual work, whereas I, as a full-fledged professor and doctor of chemistry receive for one hour of lecture 450 roubles. Consequently, to nourish the members of the family (I have, fortunately, neither wife nor children, but live with my old mother), I work in kitchen-gardens, sell the few things that are still left, etc. The prices for a new suit range up to 1,000,000 roubles; a pair of old high boots, which I could not wear and which cost originally some fifteen years ago 14 roubles, fetches now 700,000 roubles, as boots are very scarce; for a shirt you get 2 lb. of butter. During the first six months of 1921 my mother and I have eaten different foods to the value of about 6,000,000 roubles.

"Needless to say that, in spite of these millions, we are now paupers in the strict sense of the word. All my savings, made little by little during more than twenty-five years of professorship, were placed in State loans and annulled in 1917; our small landed estate not far from Petrograd was taken from us in 1918, and is now completely devastated, all the woods having been cut. It would be now utterly impossible to exist without the ration of scientists, meagre as it is.

"There are now very many proletariat 'higher institutes'; for instance, a 'Higher Institute of Anti-Fire Technique' and a 'Higher Institute of Plastic Arts'; the first turns out firemen for fire brigades, the second—dancers! 'Professors' of these institutes are also 'scientists'! Even among the professors of old high schools there are now some without scientific degrees called 'red professors'; for now it is decreed that anybody can be a professor, just as anybody who is sixteen years of age can be a student. If he is quite ignorant he will attend a 'preparatory course,' but, like real students, will receive his ration and salary (students do not *pay* anything now, but receive salaries).

"As I express myself easily in English I could not resist the temptation to give to you just a very small epitome of what is meant by 'vivere' for us, but there are many other not very agreeable things which I cannot mention now. In spite of them, the habits of twenty-five years cannot be given up, and I still interest myself in the process of chemistry . . .

"I have read over what I have written on the subject of '*primo vivere, deinde philosophari,*' and see that there is enough unintentional humour about it—but there is precious little humour in living it through."

The Work of the Government Laboratory

Government Chemist's Report

The Report of the Government Chemist upon the work of the Government Laboratory for the year ended March 31 last has been published as a White Paper [Comd. 1,490, 3d. net]. The following notes are taken from the Report.

THE total number of samples examined in the course of the year, including those dealt with at the outport chemical stations, was 308,675, as compared with 368,898 in the preceding year, a decrease of about 60,000. The samples examined at the Central Laboratories in London alone amounted to 204,653, against 199,388, an increase of approximately 5,000. Notable increases occur in the number of samples of beer for detection of dilution, spirituous preparations exported, tea on delivery for home consumption, and in sea water in connexion with the Fisheries Department of the Crown and the International Council for the Exploration of the Sea.

The work for this department consisted mainly in the examination of samples in connexion either with the assessment of duty or drawback, or with the regulations and licences relating to the manufacture and sale of dutiable articles.

During the year 22,184 samples of medicinal spirits, tinctures, perfumes, hair washes, dentrifices, liniments, extracts, infusions, &c., were examined as to their character and spirit strength in order to check the exporters' claims for drawback on the spirit used in their manufacture; and in addition 3,456 liniments, hair washes, and other preparations were tested for the presence of methylated spirit, the use of which in such preparations precludes any right to drawback on exportation. In one of these cases the presence of methyl alcohol was detected, and in 392 cases the declared strength of the preparation was overstated. Fourteen samples of so-called "solid alcohol" were examined. These preparations, consisting in general of cakes or cubes of soap or other suitable medium saturated with strong spirit, are mainly used in small portable cooking stoves.

Wood and Mineral Naphtha.

Samples of wood naphtha and mineral naphtha intended for use in the preparation of methylated spirit to the number of 733 were examined. The naphtha represented by 720 of these samples was approved as fit for methylating purposes, whilst that represented by the other 13 samples was rejected as unsuitable. For the purpose of controlling the use of duty-free methylated and other denatured spirit in connexion with manufacturing operations, 586 samples of special denaturants, specially denatured alcohol, recovered spirits, residues from stills, and articles manufactured with industrial spirit, &c., were examined.

One thousand eight hundred and forty-three papers were dealt with relating to applications to the Commissioners of Customs and Excise, either (1) in respect of claims for rebate on alcohol used in making medicinal preparations, or (2) in connexion with permission to receive methylated spirit and other forms of duty-free alcohol for use in manufactures, tuition and research. In the former instance advice was required as to whether the claims in question were such as could be properly allowed under section 4 of the Finance Act, 1918. The other references were sent chiefly for advice as to whether the purposes to which it was proposed to put the alcohol were, from the chemical point of view, such as to justify the granting of the particular indulgence asked for.

Imported Synthetic Dyestuffs

Rejected tea is allowed duty free for use in the manufacture of caffeine. In such cases the tea has first to be denatured under the supervision of Customs and Excise officers to prevent its possible use for human consumption, and samples, both of the denatured tea and the denaturants used, are submitted to the laboratory for examination to ensure that the process has been effectively carried out. The denaturants usually allowed under the regulations issued by the Commissioners of Customs and Excise are lime and asafœtida. During the latter stages of the war, however, manufacturers experienced difficulty in obtaining the latter article, and as a temporary concession permission was given to use naphthalene or other substances as denaturants. Asafœtida being now more readily obtainable is being used whenever possible.

The examinations for the Customs and Excise Department now include the analysis of imported colours, inks, perfumes, and other goods to ascertain whether they contain synthetic dyes or intermediate products, the importation of which is prohibited except under licence. Ninety such samples were examined during the year. Samples of imported matches are submitted under the White Phosphorus Matches Prohibition Act, 1908, for the purpose of ensuring that they are free from the white or yellow modification of phosphorus before they are admitted into the United Kingdon. In none of the 67 samples submitted was any evidence of the presence of white phosphorus discovered.

Goods from abroad, entering the country by parcel post, are inspected by Customs and Excise officers stationed at the various depots, and, if suspected to be of a dutiable character are sampled and sent to the laboratory for examination as to liability to duty. The number of such samples, consisting mainly of perfumery, essential oils, toilet preparations, and proprietary medicines, was 1,455.

Chemical Station Retests

In order to avoid delay in the examination of samples of imports and exports, chemical stations have been established at the more important seaports of the United Kingdom, where the samples are tested by Customs and Excise officers who have been specially trained at the Government Laboratory for this purpose.

As a check on the work of these officers the remnants of a certain number of samples tested by them are retested at the Government Laboratory. The number of such retests during the past year was 1,434, all with satisfactory results, indicating that the testing work at the outport chemical stations is performed in a highly efficient manner.

Hydrometers, for ascertaining the strength of spirits, and saccharometers, for use at breweries and glucose factories, are tested as to their accuracy, and graduated vessels of various descriptions for use in the Surveying Department are calibrated at the laboratory before being issued to the officers of Customs and Excise. During the past year 2,247 such tests were made, and, in addition, two Sikes' hydrometers were tested for the Indian Government and two for the National Physical Laboratory, by comparison with the Revenue standard instruments. Instruction in the laboratory was given to a number of officers of Customs and Excise in the application of simple chemical methods to the detection of adulterants.

Work on Effluents.

Chemical work is performed for the Admiralty in connexion with the Contract Department at Whitehall, the Naval Yards, the Engineering Department, the canteen inspections, the hospitals and schools, and the Medical Branch. The samples examined included ferrous and non-ferrous metals of all kinds, fuel oils, rubber washers and valves, soaps and paints. Special investigations were also carried out on various materials. The number of samples inspected was 739.

The work for the Air Ministry consisted chiefly in the examination of various metals and alloys used in aircraft constructions, and included some interesting investigations as to corrosion due to greases. The number of samples dealt with was 185.

Eight samples of water for drinking and boiler feed purposes were examined and 24 samples of river water and effluents were investigated as regards possible pollution of streams. Two kinds of pollution appear to be extending: effluents from milk and cheese factories, and from suction gas plants using wood and sawdust fuel. The effluents from cheese factories contain large quantities of nitrogenous constituents and organic acids and usually possess an offensive odour. They exercise a powerful degenerating effect on water and are very liable to become a nuisance unless well diluted. Pollution due to suction gas plants using sawdust arises from the water employed to purify the gas, and the effluents therefore contain some of the products of the distillation of wood, namely acetic acid, amines, methyl alcohol, acetone

and phenolic substances such as guaiacol. It has been ascertained that considerable purification of these effluents can be effected fairly readily.

A number of samples of brine, bitterns, and of the salts deposited on concentration of the brine were examined for the Revenue Service of the India Office to ascertain the proportions of bromine and other substances. Notable quantities of bromine were found, and its distribution between deposited crystals and mother liquors was ascertained. An important observation was the presence of potash salts and the comparative ease with which potassium chloride of a high degree of concentration could be obtained.

For the Potash Branch of the Board of Trade, 203 samples of potash salts taken from supplies from Germany were analysed. One of the three parts into which each sample was divided was examined here, a second portion being analysed in Germany, whilst the third portion was retained in a neutral country for analysis there in case of dispute. In a number of cases the results obtained here differed considerably from the figures supplied with the consignment, but there were only a few cases in which the Germans asked for the analysis of the third portion. The result of the reference was in all cases in substantial agreement with the analysis here.

Coal, Peat & Oil, Ltd.

Marketing a New Decoloriser Carbon

THE secretary of Coal, Peat & Oil, Ltd., of 20, Prudential Chambers, Doncaster, has issued a circular to shareholders in the following terms: The directors have the pleasure of informing you that they have been able to bring to a completion the negotiations in respect to the patent decoloriser carbon registered under the name of "Declowyte," and the sale of peat moss. They regret that these matters have taken a much longer time than was at first anticipated, owing chiefly to the disturbed condition of industry in the country during the year, which not only stopped operations at the company's works, but in the same way affected the firms which were buyers of "Declowyte." The proposals, which were referred to at the last annual meeting, were altered, with a result which, the directors are satisfied, will eventually greatly improve the prospects of the company.

With respect to "Declowyte," which is the company's chief article of manufacture at present, an agreement has been entered into with the firm of Messrs. Burt, Boulton & Haywood, Ltd., the well-known manufacturing chemists, by which they will take over, from October 1, the manufacture at the company's Earlestown works, supplying at their own expense the scientific and technical experience required, and undertake, as the company's agents, the sale of the finished product, by which your company will have the advantage of the organised and world-wide connexion of that firm. The directors consider that the terms on which this has been arranged are most satisfactory, and will lead to an early and prosperous development of the business of the company. The manufacture will be conducted for the next twelve months on the lines above stated, but after that time, if the result is as anticipated, it is intended to form a larger company to carry on the decoloriser manufacture as a separate concern. The company's moor supplies the special quality of raw material required for "Declowyte," and the reserves of peat, of the best qualities, are such as will keep operations going for many years. Digging and stacking has been carried on from the first, so as to get the peat in an air-dried condition, and the stock of all qualities now ready is estimated at about 2,500 tons.

The directors have also entered into an agreement for ten years, with the Yorkshire Peat Moss Litter Co., Ltd., to purchase at a very satisfactory price a minimum quantity of 1,500 tons of peat per annum, of the grades not required for "Declowyte." A mill and plant have now been installed on the moor for manufacturing moss litter.

The directors hope that they may be able to add some further information to the above when the Annual Meeting is held in two or three months time.

It is reported that China has reverted to NATURAL INDIGO on account of the high cost of the synthetic material in spite of the preference of buyers for the latter. Imports of synthetic indigo are said to be less than 25 per cent. of pre-war.

The Capitalistic System

Interesting Conference at Scarborough

MENTION has frequently been made in these columns of the week-end conferences for the discussion of economic problems which have been arranged by the Industrial League and Council at the private houses of various of its members. The Yorkshire Branch of the League has carried this development a step further, and for the second year in succession has organised week-end conferences on a much bigger scale at a seaside hotel. Last week-end fifty representatives of industry in Yorkshire, employers and employed, spent two days together at the Seacroft Hydro, Scarborough, discussing the capitalistic system, under the chairmanship of Mr. R. M. Lancaster, J.P., President of the Leeds Typographical Society.

Fundamental Principles

The conference was opened by Mr. Ernest J. P. Benn with an analysis of the fundamental principles of capitalism. Mr. Benn briefly traced the growth of the present complicated and delicately-balanced machinery of commerce from the earliest and most simple processes of exchange. What was known as the capitalistic system was a normal and inevitable development, and any sudden violation of the deep-seated instincts which had produced it would lead to disaster. The steady improvement in the general standard of living was due almost entirely to the energy, enterprise and courage of our so-called capitalists, who first saw a new demand and strove to supply it. Much of the objection to our present system arose from the natural human weakness of envy and malice. Success in others was irksome to those not similarly favoured. A man did not like to be passed on the road by a motor car. The remedy was not to dig up the road and put a barrier across it, but to get into a swifter car.

Co-operation as a Remedy

The exponent of the labour point of view, Mr. Andrew Dalgleish, an organiser of the Workers' Union, took up the challenge in the succeeding session. The remedy, he submitted, was co-operation. He did not pretend that this was going to happen in a night. As capitalism marked a period in the world's progress so he believed that co-operation would fill in the next period. The results of capitalism were seen in bad housing, unemployment and other social evils. The objection was not to capital as such—it was obvious that industry could not be run without it—but it was in the wrong hands, the hands of the few instead of the many.

Restriction of Output

Questions were asked after each address, and the third session was given up to open debate. The two main criticisms of the employers' representatives were that the opponents of the capitalistic system had no constructive alternative to offer, and that they were ignoring the facts of human nature and attacking the laws of life. No one denied that the system was capable of improvement, but that improvement would come only by the gradual quickening of the public and the individual conscience. Mr. J. A. Sykes, of the Yorkshire Copper Works, President of the Yorkshire Branch of the Industrial League, spoke on restriction of output, "so characteristic in this country and so absent in America," and the cost per article. While contracts were being lost daily because of our high production costs, it was useless to blame the employers for unemployment. Profit-sharing was advocated by several speakers, Mr. A. Jennings, of J. T. & J. Taylor, Ltd., Batley, giving practical examples of its workings in his firm.

The final session was devoted to the clearing up of points by Mr. Benn and Mr. Dalgleish. Each gave a definition of capitalism in answer to an inquiry. Mr. Benn advanced the word confidence as a synonym—character, reliability. As showing how confidence counts, he related how the Chinese were able at this time to borrow money at a cheaper rate than England could, and solely because China had through the ages established a reputation for steadiness and singleness of purpose.

For Mr. Dalgleish capitalism was "your capability and mine, and the product of that capability." He had no defence of restriction of output, but he instanced several examples of deliberate restriction of output by employers. He admitted that the weaknesses of human nature accounted for much of the present unhappiness, but contended that the system of capitalism accentuated and perpetuated those weaknesses.

Calico Printers' Association

Mr. Lennox Lee Criticises Dyestuffs Act

IN the course of his speech at the twenty-second ordinary general meeting of the Calico Printers' Association, at Manchester on September 22, Mr. Lennox B. Lee (the chairman), referring to trade conditions, said that during the war the country found itself cut off from certain commodities which it had been in the habit of importing. Many of these were required, not only for the purposes of industry but also of war. Therefore, it became necessary to set to work to make these things at home. In some cases this was done by the Government itself. For example, in order to secure a sufficient supply of explosives and other chemicals the Government started gigantic factories for producing the necessary materials. These had now quite rightly been scrapped, although the cost of starting them was enormous. In other cases the Government left the necessary work to be done by private firms. As a result many of these firms found themselves in a condition of financial prosperity which they had never before dreamed of. When the war ended they were reluctant that those palmy days should also end. That was perfectly intelligible; we were all of us human—even makers of optical glass and fine chemicals. What was not intelligible was that the Government should have decided to champion the interests of a few firms without regard to the interests of the nation as a whole.

The essence both of the Dyestuffs Act and of the Safeguarding of Industries Act was that certain industries were to be placed in a privileged position.

Continuing, Mr. Lee said that a general tariff on imports would injure the whole of our export industry; the injury arose in two ways. Any tariff system which tended to shut foreign goods out of this country must also tend to shut our own goods in. Sooner or later goods must be paid for by goods. As even the Americans were beginning to learn, if you did not buy you could not sell. Therefore, broadly speaking, the mere fact that a tariff tended to check imports constituted an injury to all the export industries of the country. Beyond this there was in their case, as in many others, a specific injury arising from the fact that some of the articles penalised by the tariff were the materials which they required for their manufacturing processes.

The Argument of National Safety

The principal defence put forward for the Dyestuffs Act was that the establishment of a dye-making industry in this country was essential to the national safety in time of war. If by this argument it was meant that the chemical organisation required for the manufacture of dyestuffs could be diverted to the making of poison gas and high explosives, the answer was that our capacity to produce poison gas and high explosives depended not upon dye-making in particular but upon our chemical industries in general, and these in the aggregate were already in a very strong position. It was, he said, sufficient to mention that in the year 1920, according to the Board of Trade returns our exports of "chemicals, drugs, dyes, and colours" were in value over £40,000,000, while our net imports in the same year were just under £30,000,000. There was a similar excess of exports over imports before the war. That was to say, our chemical industries, in addition to supplying a very considerable proportion of the home market, were and are able to export a much greater value of chemicals than they imported. Therefore, from the point of view of producing war materials our chemical industries needed no artificial aid.

The argument of national safety was, however, sometimes used in another form. It was argued that dyestuffs were essential to our textile industries; that if we depended on foreign countries for dyestuffs the supply might be cut off in time of war; that, therefore, it was necessary in time of peace to deprive ourselves of the advantage of foreign dyes in order that we might be sure of having home-made dyes in time of war. But dyes were only one of the many essentials to our textile industries.

We could not, in fact, by any device produce within our borders all the commodities that we wanted for our own consumption. What would it profit us in time of war to have an unlimited supply of home-made dyes if our people had no food? It was ridiculous to pretend to believe that either our national or industrial safety in war time depended on home-made dyes or magnetos, or even on home-made opera glasses or glass bottles! The policy of favouring the inefficient must ultimately fail. As soon as our goods failed in quality or price our business ceased, for no tariff that the wit of man could devise would enable us to force foreign purchasers to buy our goods if they preferred something else.

We could only succeed in excelling. If British industries were to excel, they must be permitted to obtain all the materials they required for their manufacturing processes from any part of the world at the lowest prices offered. Otherwise we should lose our export trade, which paid for our food. We could not make good that loss, as tariff-mongers seemed to imagine, by stimulating the growth of industries producing exclusively for the home market; for if we lost our exports there would be very little home market left.

Magadi Soda Company

Prospects of Increased Production Shortly

SPEAKING on Monday at the annual general meeting of the Magadi Soda Co., Ltd., at Winchester House, Old Broad Street, E.C., Mr. Samuel Samuel, M.P. (the chairman), said the War Office had definitely refused to recognise the claims of the company to compensation for military use of the Magadi railway and the water supply during the war, on the ground that they were entitled to commandeer same for military purposes. This confiscation of the company's property at the expense of the company for the benefit of the general taxpayer was, he thought, one of those high-handed operations which we should not expect from a fair-minded British Government.

The pontoon excavator, which was designed by the company's experts, had not been the immediate success that they had anticipated, and when it came to be working continuously it broke down, as the cutting machinery was not strong enough to operate on the hard soda.

They had this year an exceptionally dry season in East Africa, and with the pontoon it was necessary to have water to launch it; but the lake was virtually dry, so that they could hardly move, and, consequently, they had to revert, very reluctantly, during the present year to manual labour for the excavation of the soda at Lake Magadi.

As soon as they saw the position the directors decided to order a bucket dredger to supplement the pontoon. This dredger had already been shipped out and part of the material was in course of erection on the lake.

Notwithstanding all the difficulties, continued Mr. Samuel, the company were already actually producing 1,000 tons of soda ash of the finest quality per week, and, what was more important, they were shipping it and selling it as fast as it could be delivered to the port of Killindini. He had mentioned last year that it would be necessary, before they could start shipments, to accumulate a stock, but with their relatively small production they had found that to be an impossibility, as the buyers were so anxious to get the soda. The soda ash had been very highly appreciated in all markets, and they had ships always waiting to take it to the buyers.

From telegrams received during the last few weeks the manager at the Lake expected to be able to produce 5,000 tons a month with one calciner very shortly, and the directors hoped that before the end of the year the second calciner would be fully at work. Their production with the two calciners should be at least 8,000 tons a month; further, it was anticipated that before very long this quantity would be exceeded.

Replying to questions by shareholders, Mr. Samuel said the cost of production of the company's soda ash was lower than any other in the world. With regard to the current year's production, they had produced and shipped so far this year 27,000 tons, which was being sold at prices which would leave a small margin of profit. They would be shipping at least 5,000 tons per month during the last three months of the year and he hoped that in the second part of the year they would cover their expenses. When they attained their output of 140,000 tons a year the working expenses would immediately be reduced to one-fourth on that one item alone, and altogether, in spite of the present position, he felt confident as to the future prospects of the company.

Basic Slag Problems

Committee Presents Interim Report

THE Committee appointed by the Minister of Agriculture to investigate problems arising in connexion with the use of basic slag has presented an interim report.

Dealing first with the quantity of slag available, the Committee obtained returns from steelmakers of their production of slag in 1920, and found that something like a sixth only of the amount of high-grade slag turned out before the war is being produced now, and that even this small amount cannot be relied upon in the future. There is, however, a large output of lower grades of slag than the pre-war slag. The 260,000 tons of high-grade slag of pre-war days contained 9,880,000 units of phosphate. The 700,000 tons of last year's slag of all grades contained 15,200,000 units; of this latter amount, 560,000 tons with 13,400,000 units were of grades containing 15½ per cent. and upwards of phosphates. The problem appears in a less favourable light, however, when it is remembered that farmers before the war were not using anything like as much slag as in the opinion of competent authorities they might with advantage have used. Sir Thomas Middleton has estimated that no less than 890,000 tons per annum, equivalent to 33,820,000 units, might be used in the United Kingdom with advantage.

Dealing with the possibility of increasing the amount or quality of slag, the Committee was assured that practically the whole of the phosphorus entering the ironworks is contained in the slags which are accounted for in the figures given above. It followed that if the output of steel remains constant, the slag figures will remain substantially as they are, except that the highest grade will tend to become more scarce and the others proportionately to increase. The Committee, therefore, turned its attention to the possibility of increasing the phosphorus output by some method or methods additional to the ordinary steel-making process.

The methods being investigated in this connexion are: (1) The addition of mineral phosphate to slag in the "ladle." Experiments so far carried out give no indication of sufficient alteration in the mineral phosphate to justify the process. (2) Use of iron ore containing more phosphorus or addition of phosphate in the blast-furnace with the express purpose of obtaining a more phosphatic pig iron, and therefore a more phosphatic slag. (3) The re-introduction of the two lowest grades of slag into the blast-furnace whereby a more phosphatic pig iron would be produced, which again would yield a higher phosphatic slag.

The Committee also decided to ascertain the agricultural value of present-day slags as compared with the basic Bessemer slags, and experiments were put in hand at the beginning of the inquiry. Mineral phosphates were included in the trial in order to ascertain whether they could justifiably be used in increasing the phosphatic content of the slag. Further experiments have been arranged at Rothamsted to elucidate points remaining in doubt.

A Benzol Research Committee

A JOINT research committee has been formed by the National Benzole Association and the University of Leeds which will take over the direction of research in the extraction and utilisation of benzole and similar products in this country. The National Benzole Association is concerned with the production of crude and refined benzole, and, according to its constitution, one of its objects is to carry on, assist, and promote investigation and research. The term "benzole" is used in its widest sense, so the field of activity of the association embraces carbonisation and gasification processes, by-product coke-oven plants, gasworks, &c., but at the present time it is concerned mostly with the promotion of home production of light, oil and motor spirit. Success in this direction is thought to rest largely with chemical investigations into the possibilities of the various processes concerned, and it is with this object that co-operation with the University is sought. The joint committee, says *Nature*, consists of equal numbers of representatives from the University and the Association, and the initial membership is as follows: Professor J. W. Cobb, Professor J. B. Cohen, Professor A. G. Perkin, Professor Granville Poole, Professor A. Smithells, Mr. W. G. Adam, Dr. T. Howard Butler, Mr. S. Henshaw, Mr. S. A. Sadler, and Dr. E. W. Smith. Research work undertaken will be carried out under the supervision of Professor Cobb, and reports embodying the results will be published at intervals.

Safeguarding of Industries

Goods Subject to Duty

IN response to a request from the Chemical & Dyestuff Trader's Association for a written ruling to remove the uncertainty that prevails respecting the goods subject to duty to-day (Saturday), the following reply has been received from the Commissioners of Customs and Excise:—

In answer to your letter of the 15th inst., I am directed by the Commissioners of Customs and Excise to state:—

(1) That duty under Part I. of the Safeguarding of Industries Act, 1921 (Key Industriy duty), will be chargeable on all goods of the kinds liable thereto which have not been reported by the importing vessel and entered with the Customs by the close of the working day on September 30. Goods which have been so reported and entered will not be liable to the duty, even though they may not have been cleared out of Customs charge prior to October 1.

(2) Goods liable to Key Industry duty, and not to any other Customs duty, will not be admissible to bonded warehouses, and the duty must be paid on the first importation of such goods.

Rules of Procedure for Committees

The Board of Trade have made the following rules of procedure for Committees under Part II. of the Safeguarding of Industries Act, in pursuance of Section 7 (3):—

1. If the Board of Trade decide to refer any matter under Section 2 of the Safeguarding of Industries Act, 1921, to a Committee constituted in accordance with Section 7 of the Act the Board will as soon as may be after the appointment of the Committee publish in the London, Edinburgh, and Dublin *Gazettes*, and in such other manner as the Board think proper, a notice stating: (*a*) The terms of reference to the Committee; (*b*) the time and place at which the Committee propose to hold their first sitting for the taking of evidence, which shall be not less than fourteen days after the date on which publication of the notice is completed.

2. The Board of Trade will appoint a Chairman of the Committee who shall preside at any meeting of the Committee.

3. The sittings of the Committee at which evidence is taken shall be held in public, except that the Committee shall refuse to allow the public to be present at any proceedings of the Committee during the hearing of evidence on matters which, in their opinion, are of a confidential character.

4. The Committee shall be at liberty to take evidence in such manner as they shall think fit.

5. Any person desiring to give evidence shall give notice to the Secretary of the Committee, and shall furnish, with his notice, a statement in writing of the evidence he proposes to give.

6. The Committee shall be at liberty to decide whether they will or will not receive the evidence of any person who desires to give evidence, and their decision shall be final.

7. A witness whom the Committee desire to hear may, if he wishes, be accompanied by solicitor or counsel, who may address the Committee on his behalf, but no witness shall be examined or cross-examined except by the members of the Committee.

Directors' Commissions and E.P.D.

AT a meeting of the Bradford Dyers' Association, Ltd., held on September 23, it was agreed that in all cases where the remuneration of directors and others consists of or includes commission on net profits that commission ought to be calculated upon the amount of profit before taking therefrom any excess profit duty payable by the association, and that such adjustment of accounts as might be necessary be put into force as from the date at which such statutory liability first took effect. The Chairman said the resolution arose out of a recent decision of the Court of Appeal regarding the collection of commission payable on profits in relation to the incidence of excess profits duty. The whole purpose of the resolution was to legalise the position, so as to remove the injustice of any commission taken being subject to excess profits duty. The resolution was agreed to.

It is interesting to note that coincident with the coming into operation of the SAFEGUARDING OF INDUSTRIES ACT TO-DAY (Saturday) prices for British-made glassware of all kinds are considerably reduced.

Institute of Metals

The Importance of Research Work Emphasised

THE autumn meeting of the Institute of Metals, at Birmingham, on Wednesday and Thursday last, passed off most successfully. It brought together a very large number of the leading scientists engaged in metallurgical investigations as well as a host of industrial chemists. On the first day of the conference the members were entertained to luncheon as the guests of the Non-Ferrous Metal Trades' Associations.

Mr. John W. Earle, who presided, gave the toast of "The Institute," pointing out that the scientific work accomplished by the Institute had opened many doors, and they were looking to it more and more to extend the scope of the industry. The toast was acknowledged by Engineer Vice-Admiral Sir George Goodwin, who pointed out that the efficiency of our industries, not only commercially but technically and scientifically, must depend upon the fullest and closest co-operation of all concerned. Continued research was absolutely necessary. Did we realise, he asked, how the condition of excellence reflected in so many trades had been reached? Generally it was through experiments, in the laboratory and the workshops, with materials and machinery on the part of one or two or more individuals, and their work had been adopted in manufactures, very often without sufficient remuneration to the individuals who originated it. He believed the Research Association was going to form a useful link between the Institute and the Trade Associations.

The importance of research in relation to industry was emphasised later in the day by the Principal (Mr. C. Grant Robertson) of the Birmingham University, which the delegates visited, special interest being taken in the chemistry and physics departments (Professors G. T. Morgan and S. W. J. Smith); Mining and Metallurgy (Professors K. N. Moss and T. Turner); and Engineering (Professor W. F. Burstall). Principal Robertson pointed out that the duty of the Birmingham University was to serve all the great industrial and commercial needs in the Midland area. They were endeavouring to provide a professional training in mining, engineering in all its departments, chemistry, geology and metallurgy, while their other duty was in relation to research. He believed Birmingham was the first university to set up a Standing Joint Committee on Research whose duty it would be to co-ordinate the Research work of the University, and to make the policy of Research equally related to the work, both of the University and the great industries that surrounded them. His view was that if they were going to have a policy of scientific education, and of research not merely confined to a policy of applied science, they had to cultivate the mind before they came to the industrial applications.

One of the great duties of a university was to find researchers. There was a supposition in the popular mind that anybody who had had a university education, and many who had not, were qualified to undertake research. There could be no more profound mistake. Researchers might be born, but it was essential that they should be properly trained and selected. Machine-made research was futile.

The Scientist in Organised Research

AT a meeting held in Edinburgh on September 13 under the auspices of the National Union of Scientific Workers, Professor H. Levy delivered an address on "The Function of the Scientist in Organised Research." Professor Levy laid stress on the fact that by research new fields of inquiry were being opened up and new crafts being created. The status of the work, as well as that of the worker, must therefore receive consideration. Any tendency to make research a commercial undertaking was deprecated as liable to stifle investigations of extreme importance, though possibly of an abstract nature. The idea of training the administrator in research was regarded as out of the question, the two faculties being, when approached in this order, diametrically opposed. With regard to the status of the research worker, it was maintained that such security of tenure must be granted as would admit of unfettered criticism, and that the remuneration attached to appointments of a scientific nature, whether administrative or practical, should correspond with that attached to posts of a similar grade in other branches of Government service. The co-operation of men of science of all kinds was necessary in order to promote the interests of research.

German Dyestuffs Industry

Factory Siezed by Workpeople

WRITING to the *Liverpool Daily Post* from Berlin, Mr. A. A. Davidson states that the Hoechst dyeworks are at present in the hands of the workers. According to Mr. Davidson, there was a dispute regarding a wages agreement between the workers and the directors, especially with regard to the workers' fund, to which, it was alleged, the company should have allotted twelve million marks from last year's earnings, but of which only a small part has been allotted.

Negotiations on this point were proceeding satisfactorily when an official of the company is alleged to have been overheard to make the remark, in connexion with the recent explosion at Oppau, "Nothing much the matter. Only a few proletarians blown in the air." The remark seems to have been seized on with avidity by the Communist leaders at Hoechst, who obtained the expulsion of the members of the workers' councils and the trade union leaders from the negotiations with the directors, and appointed a Communist commission to look after the workers' interests. This commission proceeded to the occupation of the factory by the workers, an admission pass issued by the directors being no longer valid. From reports reaching Berlin, it is difficult to obtain an idea of the scope of the movement, although later reports say that the workers' council and the trade union leaders may soon regain authority from the Communists.

It is further reported that the Chemische Fabrik at Griesheim has closed down and dismissed all its employees, owing to the alleged unreasonable wage demands.

Future of Alsatian Potash Mines

WRITING from Paris a special correspondent of the *Daily Telegraph* refers to the judgment by which France lost most of the potash mines in Alsace which came to her after she regained her two lost provinces (*see* THE CHEMICAL AGE, Vol. V, p. 256). This judgment, he says, caused considerable excitement throughout France, more especially as it was alleged that the Germans had been able to keep most of the shares in the mines. Not only did the Mulhouse verdict go against France, but Senator Helmer, who, after the armistice, had been appointed by the French Government to place the mines under sequestration, was ordered to pay 200,000f. costs. This judgment was appealed against, and the appeal has been heard by the Colmar tribunal, which, after two sittings, will give its decision in a week.

Recalling the initiation of the action he states that on January 3, 1919, Henri Koch, an Alsatian, who had been manager of the German company which exploited the potash mines, bought from this company 4,500 shares for 49,000,000 marks, and a few days later asked Senator Helmer to recognise his claim and to exchange the old shares which had been annulled into new ones. The fact that Koch had been manager of the German company made Senator Helmer doubt the genuineness of the purchase, and in order to safeguard the interests of France he refused to recognise the transaction. Koch made a second demand for recognition of twenty-nine shares only, and again met with a refusal. He then had recourse to the Mulhouse Court, which decided in his favour, giving him possession of all the shares claimed.

At the hearing of the appeal Senator Helmer, defended the course he had adopted and demanded the rescission of the Mulhouse judgment. M. Kuntz, the Procureur Géneral, went into the history of the case, and concluded that the Mulhouse judgment should be quashed in so far as the 4,500 shares were concerned, but that Koch should be given the twenty-nine shares he claimed.

Recent Wills

Mr. T. B. Lightfoot, of Heathfield Gardens, Putney Heath, and Queen Victoria Street, E.C., consulting engineer, a director of Bell's United Asbestos Co. and the British Oxygen Co. £50,723

Mr. Gamble North, of Silverlands, Bridge, and of Pisagua, nitrate agent, director of New Paccha & Jazpampa Nitrate Company, Ltd., of the Nitrate Producers' Steamship Co., Ltd., of Great Boulder No. 1, Ltd., and of the Great Boulder Proprietary Gold Mines, Ltd..... £269,753

Manchester Chemical Trade

Sir S. W. Royse & Co.'s Monthly Report

DURING the early part of September trade remained dull, but recently there has been a better tone and an increased business put through. Prices generally are steadier. Some uncertainty has existed and still exists as to which products are affected by the Safeguarding of Industries Act, which comes into operation on October 1, and it remains to be seen what will be the effect of that measure.

Sulphate of copper has been receiving more attention and some good business has been done for forward delivery on export account; price has remained steady and some makers are holding for what at present appear to be prohibitive values. Green copperas has only had a limited inquiry. Acetic acid has latterly come into request, the higher grades being affected by the new import regulations. Acetates of lime have been slow of sale and are weak. Stocks of acetate of soda have been reduced, and with the position somewhat obscure, higher prices are now being asked for available supplies. Lead salts have been moving more freely with little alteration in values. Carbonate and caustic potash have been in rather better demand. There have been some recent arrivals of Montreal potashes, which are being pressed for sale. Yellow prussiate of potash has been steadily called for and is rather firmer; soda has advanced strongly and some good quantities have been sold for export, but for early shipment only. White powdered arsenic has been in better request at the lower prices ruling.

Tartaric acid has been selling more freely at unchanged prices; the forward position is, however, firmer with the possibility of stoppage of supplies from abroad. Cream of tartar is also affected by the new import regulations, but there are fair stocks here. Citric acid is dull and the price is lower. Bichromates are unchanged but more has been doing in chlorates. Oxalic acid has been in active demand; stocks are only small and values have an upward tendency. Borax and boracic acid have been in steady request, but phosphate of soda has been little inquired for. Alum and sulphate of alumina continue disappointing and have a tendency to lower prices. The export trade for muriate of ammonia has been small through severe competition from the Continent and the market is weak. Bleaching powder has been in moderate demand and white caustic soda and ammonia alkali have had an improved inquiry. Lump salammoniac is rather better, but business is confined to small lots. There is practically nothing new to report in tar products. Benzoles and toluoles remain scarce without alteration in price. Solvent naphtha keeps in good demand for spot delivery, and price is well maintained; consumers have little confidence in the forward position and prefer waiting in anticipation of lower values. Crude carbolic acid is lifeless, but cresylic is in steady request. There is an easier tone in naphthalenes, the demand being small. A fair business is passing in pitch at the reduced values, makers showing more disposition to meet the Continental competition. Sulphate of ammonia for export is more active and price remains steady. The position in sulphate of barytes is unchanged, competition being very keen and concessions made in prices.

The Rubber Market

FRANCIS WELBY & CO.; 9, Mincing Lane, E.C. 3, in their rubber report of September 24, state:—With regard to plantation rubber, a steady demand from America resulted in an advance of nearly 1d. per lb. during the week, and a large business was transacted at each advance. America had also been a larger buyer in the Singapore market, where prices advanced to a parity rather higher than London. The predominant demand was for ribbed smoked sheet, the price for which almost closed up to that of standard crepe. Although the stocks in London were over 73,000 tons, the highest on record, a more optimistic tone permeated the market, and, as the result of the heavy trading during the week, it is hoped that a substantial reduction in these stocks will be disclosed in the near future. The Para market was slightly firmer. Hard fine, 1s. 1d.; soft fine, 1s. 0¼d.; Caucho ball, 7d. A continuance of the present firm market is anticipated.

Vauxhall Glass Company

Shareholders Carry Motion for Voluntary Liquidation

AN extraordinary general meeting of the Vauxhall Glass Manufacturing Co., Ltd., was held on Wednesday, at Winchester House, E.C., to consider a resolution placing the company in voluntary liquidation owing to "the stagnant and precarious state of the glass industry, and, consequently, the impossibility of raising further working capital."

Sir CORNTHWAITE H. RASON (the chairman) said the directors had written to the Board of Trade: "We shall esteem it a great favour if you can inform us by return of post, in time for a meeting of our directors next week, the approximate date when the Key Industries Bill is likely to become operative, and whether under Section 2 of that Bill, illuminating glass is likely to be protected. If so, would such protection amount to more than 33⅓ per cent. At present the rate of exchange with Germany, a large importer of illuminating glass, is about 2,000 per cent. in their favour." The reply received from the Department of Overseas Trade read as follows: "With reference to your letter of the 16th inst., I have to say that as regards Part 2 of the Safeguarding of Industries Act, it will be observed that various formalities are necessary before any duty can be imposed under that part of the Act, and a considerable time must necessarily elapse between the original complaint to the Board of Trade and the imposition of any duty in consequence of such complaint. It is, moreover, impossible to state whether illuminating glass will be protected. In any case, Section 3 (1) of the Act limits the duty to be imposed to 33⅓ per cent. *ad valorem*."

Shareholders would see that any such safeguard as was outlined there, even if it did come into force, would be of very little use to the company. The position was that at the outset this company, in common with others, was encouraged by the Government to build factories to give employment to labour here, and to manufacture articles in this country which had previously been manufactured abroad. Their company had established works for that purpose—works which were doing well, with good customers, and with plenty of orders, and which were turning out a first-class article and putting it on the market at reasonable prices—not only reasonable, but at a less price than the German pre-war price. Then, suddenly, the whole market had been swamped with the German article which had been offered at a price which rendered competition on their part absolutely hopeless.

It was not so much a protective tariff that was required as some means of adjusting or stabilising the rates of exchange. With the mark at 475 to the £, as it was to-day, everybody would realise that it was utterly impossible for British manufacturers to compete.

The liabilities of the company amounted to about £13,615, and the assets consisted of stocks, debtors, calls due and cash in hand, amounting to £1,528, and leaving a deficit of just over £12,000. As against that they had one of the most up-to-date glass factories in England, which stood in their books at cost price of just over £40,000, though what its realisable value was he would not say. With careful nursing it should be possible to pay the creditors in full, and leave something over for the preference shareholders, but, under voluntary liquidation, should the position of the glass industry improve, there would always be the possibility of arranging some scheme of reconstruction.

After some discussion the motion was carried.

BRITISH ALIZARINE CO.—The directors announce that in view of the general depression existing it is inadvisable to make a distribution by way of interim dividend. Last year, 5 per cent.

SCARAB OIL BURNING CO., LTD.—Dealings in the following securities have been specially allowed by the Stock Exchange Committee under Rule 148A: 12,000 7 per cent. cumulative participating preference shares of £1 each, fully paid, Nos. 60,001 to 72,000. These securities will rank *pari passu* with those in which special settling days have already been appointed as soon as they are identical and the certificates are ready for distribution, and with those for which an official quotation has already been granted as soon as they are identical and are officially quoted.

From Week to Week

—Mr. FRANCIS W. LEWIS, who has been associated with the Company for the past twenty-five years, has accepted a seat on the board of A. Boake, Roberts & Co., Ltd.

The PASTEX CO., LTD., of Cromwell House, Surrey Street, Strand, W.C.2, inform us that they are removing to larger premises at 11, Agar Street, Strand, W.C.2.

As from October 15, the head office of the SUNLIGHT ENAMEL & PAINT CO., LTD., Guildhall Chambers, Newcastle-on-Tyne, will be at 6, Broad Street Place, London, E.C.2.

DR. W. R. ORMANDY announces that he has removed from Oakley House, Bloomsbury Street, to 18, Belsize Grove, Belsize Park, N.W.3. The telephone number is Hampstead 4898.

AN EXPLOSION occurred on September 25 at the saltpetre works at Kleinlaufenburg, near Karlsruhe. Several workmen are reported to have been killed, and the material damage is said to be considerable.

C. CHRISTOPHERSON & CO., of 6, Lloyd's Avenue, London, E.C.3, have been appointed sole selling agents for Europe for the "Three Elephant" brand of borax. This borax is obtained by the American Trona Corporation, of New York, from a lake bottom in California, and is subsequently treated at their refinery at Trona.

The death has taken place at Ottershaw Park, Chertsey, of Mrs. Julie Ann Schintz, aged 78, widow of Mr. Hans Gaspard Schintz, late of Childwall Hall, Liverpool, who died in 1913, and who was known as the "NITRATE KING," leaving a fortune of over £1,000,000 sterling. The bulk of his fortune was left to his daughter, who is unmarried.

Whilst engaged in the removal of a heap of phosphates at the premises of Joseph Fison & Co., Ltd., of Ipswich, on September 20, Arthur William Bumstead, an employee, was caught by a fall of material from the face of the heap. He sustained serious internal injuries, and succumbed at the East Suffolk and Ipswich Hospital shortly after admission.

The Salters' Institute of Industrial Chemistry has awarded FELLOWSHIPS FOR POST-GRADUATE STUDY in the laboratories indicated to Messrs. J. A. Gentle, B.Sc. (Oxford), F. Raymond Jones, M.C., B.Sc. (Birmingham), S. J. Saint, B.Sc. (Reading) and F. W. Turner, B.Sc. (East London College). Scholarships have been awarded to Messrs. B. G. Banks and L. G. Laws.

Sir Ernest Shackleton has taken an "Oertling" balance with him on the "Quest." It is interesting to recall that an "Oertling" balance was also taken by Admiral Sir George Nares, on his expedition in 1873, and the same balance was used by the late Captain Scott in his expedition in 1901; during the war this same balance was used by the Engineering Department of the South Kensington Museum.

The success attending the series of public meetings held at the Caxton Hall last year, under the auspices of the INDUSTRIAL LEAGUE AND COUNCIL, proved so great that a further session has been arranged during the coming autumn and winter. The opening meeting will be held at the Caxton Hall on October 5 at 7.30 p.m., when Mr. Ernest J. P. Benn will give an address on the Capitalistic System.

The second day's proceedings of the technical section of the PAPERMAKERS' ASSOCIATION OF GREAT BRITAIN AND IRELAND were carried through in Edinburgh on September 22, when an inspection was made of the chemical, engineering, and technical departments of the Heriot-Watt College, St. Catherine's Works, Sciennes, belonging to Messrs. Bertrams, Ltd., Messrs. Gemmell and Thin's laboratories, and the new chemical laboratories of the University of Edinburgh.

Notice is given by the Rates Advisory Committee, Ministry of Transport, that the railway companies have lodged proposals in regard to A NEW CLASSIFICATION for (1) coal, coke, and patent fuel, and (2) returned empties. Objectors must lodge four copies of their detailed objections with the Secretary of the Rates Advisory Committee in regard to coal, coke, and patent fuel not later than October 10, and in regard to returned empties not later than October 17.

Particulars of the registration of the Rubber Shareholders' Association were given in THE CHEMICAL AGE last week. It is now announced that upon the unanimous invitation of the committee of the Association Mr. D. F. L. Zorn has consented to become chairman of that body, in place of Mr. R. W. Jones, who had occupied the position *pro tem.* The first ordinary general meeting will take place at Winchester House, E.C. 2, on October 3, at 2.30 p.m.

The autumn meeting of the Refractory Materials Section of the CERAMIC SOCIETY is to be held at the Institution of Mechanical Engineers on October 6 and 7, when the following papers will be read: "Refractory Materials of the London Basin," H. Dewey; "The Marlow Gas-fired Tunnel Oven," J. H. Marlow; "A New Type of Tunnel Kiln, Oil-fired, with many Novel Features," P. J. Woolf; "Aluminothermic Corundum as Refractory Materials," Dr. A. Granger; and "The Reversible Thermal Expansion of Silica," Professor J. W. Cobb and H. S. Houldsworth.

The following are among the SPECIAL ADVANCED LECTURES which have been arranged at King's College, London, for post-graduate and other advanced students. The dates given are those on which the courses begin:—"Liquid Fuels," Mr. Harold Moore, October 17; "Liquid Fuel Engines," Dr. W. R. Ormandy, October 24; "Cascade Induction and Synchronous Motors and Generators," Mr. L. J. Hunt, October 18; "Reinforced Concrete," Dr. Oscar Faber, January 19, 1922; and "Accurate Measurements in Mechanical Engineering: The Use and Testing of Gauges," Mr. F. H. Rolt, January 24.

Serious damage was caused in the early hours of Tuesday morning by a fire at the soap manufacturing and glycerine refining works of Gerard Brothers, Ltd., Gauntley Street, Nottingham. The greater part of the premises were destroyed, and most of the machinery, which was of the latest type. About 130 men and girls are thrown out of employment. The fire was discovered after 11 p.m. on Monday by a workman in the glycerine department, who says it broke out behind one of the big boiling pans. There was no light near the pans, all of which were shut down for the night, and the cause of the outbreak is at present unknown. Although the Corporation Fire Brigade, with three motor engines, fought valiantly, there was little hope from the first of saving the three-storeyed building and its contents.

Something in the nature of an interim report has been issued to their shareholders by the directors of LOW TEMPERATURE CARBONISATION, LTD. The board states that the works at Barnsley have now been re-opened, after the temporary closing in connexion with the coal strike, and that the production of coalite has been resumed, with the assurance of a constant and increasing, although at present limited, supply. The circular further states that the large demand for the fuel is being met in rotation of orders on hand, that very rapid progress has been made with the company's developments, and that important economic results have already been obtained from the plant.

At the first Ordinary Scientific Meeting of THE CHEMICAL SOCIETY, on October 6, at 8 p.m., the following papers are expected to be read:—"A new adjustable thermostat for all temperatures between 0° and 100°," by S. J. Lewis and F. M. Wood; "The separation of miscible liquids by distillation: laboratory still-heads," by A. F. Dufton; "The separation of miscible liquids by distillation: a continuous laboratory still," by A. F. Dufton; "Experiments on the synthesis of the polyacetic acids of methane: an addendum to Parts I and III," by C. K. Ingold and E. A. Perren; and "Experiments on the synthesis of the polyacetic acids of methane, Part IV: "The preparation of β-carboxymethanetriacetic acid," by C. K. Ingold and W. J. Powell.

As a result of negotiations between the South Wales patent fuel manufacturers and the Dock, Wharf and Riverside Workers' Union, it has been agreed that the WAGES OF THE CARDIFF FUEL WORKERS, following those adopted at Swansea six weeks ago, shall be reduced immediately by a further shilling per day to day workers and by 5 per cent. to piece workers, making a total reduction of 3s. per day and 15 per cent. respectively since August 1 last. The new rates are 15s. 6d. per day for a five-day week to labourers; an average of £5 3s. 9d. to piecework men, which includes pugmen, pressmen, coalmen, pitchmen and stowers; £4 14s. 6d. a week to boatmen, and £2 7s. 1½d. to boat boys; while the earning of the shipping men will average £8 8s. for a full week's employment.

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MOLECULAR COMPOUNDS. The addition of organic bases to metallic salts. W. Peters. *Z. anorg. u. allg. Chem.*, August 8, 1921, pp. 172-176.

INORGANIC ACIDS. The structure of pyrophosphoric acid. D. Balarew. *Z. anorg. u. allg. Chem.*, August 8, 1921, pp. 123-130.

Antimonic acid and the analytical application of sodium antimonate. E. S. Tomula. *Z. anorg. u. allg. Chem.*, August 8, 1921, pp. 81-92.

CEMENT. Equilibrium between cement and lime water. R. Lorenz and G. Haegermann. *Z. anorg. u. allg. Chem.*, August 8, 1921, pp. 193-201.

ANALYSIS. A new method for the estimation of thiosulphate in the presence of sulphite and tetrathionate. A. Kurtenacker and A. Fritsch. *Z. anorg. u. allg. Chem.*, August 8, 1921, pp. 262-266.

COMBUSTION. Combustion of liquid fuels in motors, with particular reference to the analysis of the fuel and its gaseous products. Part I. F. Wehrmann. *Z. Elektrochem.*, September 1, 1921, pp. 379-393.

Patent Literature

Abstracts of Complete Specifications

168,097. Copper Nickel Matte, Treatment of. E. E. Naef, 16, Loughborough Road, West Bridgford, Nottingham. Application date, April 20, 1920.

The object is to eliminate the sulphur from copper-nickel matte in the manufacture of copper and nickel or their salts, without the usual roasting process. The process is based on the conversion of the sulphur into sodium sulphide and sodium thiosulphate by fusing the matte with caustic soda at 300°C. to 600°C. In an example, one part of very finely divided bessemerised or unbessemerised copper-nickel matte containing about equal parts of copper and nickel and 16-25 per cent. of sulphur is mixed with 0·05 parts of finely ground coal and 3-5 parts of caustic soda. The mixture is heated for 3-5 minutes to 450°-550°C. Water vapour is evolved and the metals are precipitated as a fine powder. The mixture of excess of caustic soda with sodium sulphide may be poured off and used again, or the whole mass may be cooled, broken up, and extracted with water. The precipitate of metals is filtered off and the solution of sodium salts is crystallised. The caustic soda may be replaced by mixtures thereof with sodium carbonate, chloride, sulphate, sulphide, calcium oxide or hydroxide. The reaction may also be effected in the presence of hydrogen, in which case sodium hydro-sulphide is produced. The mixture of copper and nickel may be treated with carbon monoxide to form nickel carbonyl, which is then treated in known manner to recover the nickel. Alternatively the mixture of copper and nickel may be heated with dilute sulphuric acid, which converts the nickel only into a solution of nickel sulphate, which may then be crystallised. Reference is directed in pursuance of Section 7, Sub-section 4 of the Patents and Designs Acts, 1907 and 1919, to Specification No. 499/1893.

168,098. Concentration of Oxidised Ores. L. A. Wood and Minerals Separation, Ltd., 62, London Wall, London, E.C. 2. Application date, April 20, 1920.

The process is more particularly for the concentration of tin ores by froth flotation. When the tin is present as cassiterite associated with quartz, mica, chlorite, schorl, tourmaline, &c., it is found that some gangue constituents have a tendency to float with the mineral, while if the floating is prevented by known methods, the flotation of the cassiterite may also be affected. It is now found that if the separation is effected in the presence of carbon dioxide, flotation of the gangue is prevented without affecting the flotation of the cassiterite. The finely pulverised ore is mixed with water, and introduced into a sub-aeration plant with oleic acid or its near homologues or compounds such as soap as the frothing agent. Carbon dioxide is introduced into the pulp, and is preferably used as the flotation agent as well as the gangue modifying agent. Results of several tests are given showing a recovery of the tin varying from 65 to 96 per cent. The process is also applicable to other oxidised ores, such as wolfram ores, mixed silicates and carbonates of zinc and lead, and oxidised ores of copper.

168,108. Purification of Organic Bodies by Distillation. F. W. Berk & Co., Ltd., 1, Fenchurch Avenue, London, E.C. 3, and J. J. Hood, 4, Canonbury Park North, London, N. 1. Application date, April 24, 1920.

The process is for separating impurities from a large class of organic bodies in a continuous manner by distillation. The substance is mixed with a complex mineral oil, the boiling points of whose constituents vary within wide limits, and the mixture is fractionally distilled. In one example crude resorcinol, which is usually obtained as a deep brown solution in amyl alcohol, is mixed with kerosene having a boiling point varying between 150°C. and 320°C., and distilled. The distillate comprises, in succession, water, amyl, alcohol, the low boiling fractions of the oil, phenol from the resorcinol, and more oil at 205°-210°C. Pure resorcinol then distils over and crystallises out of the oil in the receiver. The separated oil may be used again. The application of the process to the purification of crude anthracene cake requires a higher boiling oil such as solar oil or fuel oil, having a boiling point from 300° to 450°C. Carbozole, anthracene, and phenanthrene are distilled over in succession, and are separated from the oil by centrifuging. Crude anthraquinone is purified in a similar manner. In a modification of the process, the crude material is mixed with an oil having a boiling point above that of any constituent to be distilled. The still is heated and steam is passed through the mixture at successively increasing temperatures, to distil off in succession the constituents of the crude material.

168,229. Vertical Retorts. C. W. Tozer, 66, Victoria Street, Westminster, London. Application date, July 30, 1920.

A vertical retort for the carbonisation and gasification of coal, cannel, lignite, &c., comprises three concentric chambers which communicate with one another by means of perforations in the walls at the middle zone. These chambers do not extend either to the top or the bottom of the outer casing, and at the lower end the walls are of such a length that the open lower end of the retort is of conical form. A conical false bottom is provided which rests against a seating on the bottom of the outer casing, but is slightly spaced from the bottom of the intermediate walls. This space serves for the passage of gases from the outer vertical chambers to the central vertical chamber. The outer surface of the casing is provided with a series of vertical or helical ribs to increase the heating surface.

168,245. Cylindrical Kilns. W. J. Mellersh-Jackson, London. (From Fuller-Lehigh Co., Fullerton, Lehigh, Pa., U.S.A.) Application date, August 21, 1920.

A cylindrical rotary kiln is composed of a number of longitudinal sections each of rectangular form and having a radial flange extending outwardly for connection to the corresponding flange of the adjacent section. A cylinder having a smooth interior surface is thus formed, and is provided with a lining of reverberatory material which is also built up of a number of longitudinal sections, so as to form a smooth cylindrical interior surface covering the whole of the inner surface of the kiln.

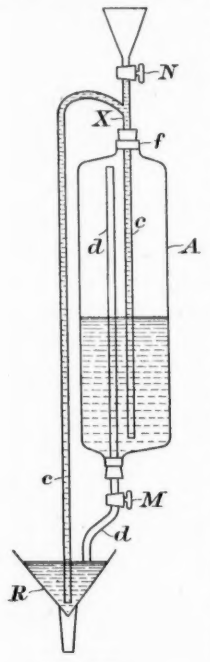
168,261. Refractory Articles, and Method of Making the Same. The Carborundum Co., Ltd., Trafford Park, Manchester. (From S. C. Linbarger, of the Carborundum Co., Niagara Falls, U.S.A.). Application date, September 25, 1920.

The process is for manufacturing composite refractory articles having one face consisting mainly or wholly of silicon carbide, and a backing of fire clay or other refractory material. Refractory articles containing a high percentage of silicon carbide are capable of resisting intense heat, and are inert to many chemical substances, but they are better conductors of heat and more expensive than similar articles of fireclay material. The high heat conductivity is an advantage in articles such as retorts and muffles, but is a disadvantage in the lining of furnaces. In this invention the refractory article is built up of successive layers, the outer layers having as their predominant elements fireclay on the one side and silicon carbide on the other side. The intermediate layers are formed of a mixture of the two substances, the proportion of silicon carbide decreasing in successive steps from the silicon carbide layer on the one side, to the fireclay layer on the other side. The outer layer may not consist entirely of silicon carbide, but may be mixed with fireclay in the proportion of 0 to 50 per cent. The article is built up in a mould by adding the different layers in succession, the surface of each layer being roughened to facilitate its combination with the next layer. The difference in the coefficient of expansion of adjacent layers is relatively small, so that separation of adjacent layers owing to unequal expansion is avoided.

168,262. Filtration, Percolation and the Like, Apparatus for Automatic Supply of Liquid to Replace Amounts Discharged in Processes of. W. T. Keeling, 53, Stamford Road, Handsworth, Birmingham. Application date, October 7, 1920.

The apparatus is for automatically maintaining the liquid

level in a filtering funnel, percolator or the like, and so avoiding the usual manual filling of the funnel at intervals. The container *A* for the liquid to be filtered is provided with a tube *d*, extending from the required liquid level in the funnel *R*, nearly to the top of the vessel *A*. A tube *c* extends from the bottom of the vessel *A* through the stopper *f*, and then downwards to a point below the liquid level in the funnel *R*, so that it acts as a syphon. A supply funnel is connected at the point *X*, and taps *N*, *M* are provided. Both taps are first opened, and the liquid is introduced through the funnel while air escapes through the tube *d*. The tap *M* is then closed, and more liquid is added until it flows into and fills the small tube *c*. The tap *N* is then closed so that the tube *c* acts as a syphon, and the tap *M* opened to allow air to enter the vessel *A* to replace the liquid withdrawn. The admission of air ceases and the syphon stops when the rise of liquid in the funnel *R* seals the end of the tube *d*. When the liquid falls in the funnel *R* the action of the syphon is resumed. A simpler form of the apparatus is also described. Reference is directed in pursuance of Section 7, Sub-section 4, of the Patents and Designs Acts, 1907 and 1919, to Specifications 12,894/1897, 17,057/1908, 24,234/1910, and 19,094/1913.



168,262

168,279. Filtration of Blast Furnace and Like Gases. Halbergerhütte, G.m.b.H. Halbergerhütte, near Brebach, Germany. International Convention date, December 1, 1920.

A filter plant for blast furnace gases usually comprises a temperature regulator, a filter formed of tubes, sheets or the like of filtering material, a suction fan for drawing the gas through the filter, and a cooler. The gas passes through these devices in succession. In this invention the suction fan is dispensed with and the gas is passed directly through the filter at the pressure of the blast furnace. The resistance of the filter would not exceed 100 mm. of water, so that a total pressure of 200 mm. would be sufficient for the cleaning gas which is forced through the filter in the reverse direction to clean it. A small fan only would be sufficient for this purpose, and the running costs of the main suction fan are thus avoided.

Note.—Abstracts of the following specifications which are now accepted appeared in The Chemical Age when they became open to inspection under the International Convention: 136,564 (F. Hansgirg), relating to a method of obtaining perylene, *see* Vol. II., p. 210; 140,798 (Worthington Pump & Machinery Corporation), relating to filter presses, *see* Vol. II., p. 615; 145,085 (A. L. Mond-Metallbank und Metallurgische Ges.), relating to treatment of sal-ammoniac skimmings, *see* Vol. III., p. 243; 147,045 (Soc. Générale d'Evaporation Procédés Prache & Bouillon), relating to decomposition of soapy waters, *see* Vol. III., p. 404; 148,781 (A. Riedel), relating to manufacture of coke for blast furnaces, *see* Vol. III., p. 487.

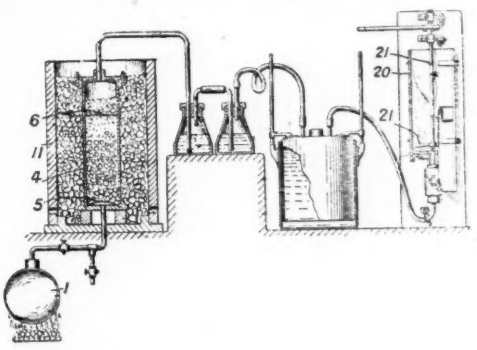
International Specifications not yet Accepted

166,887. Cyanamides, &c. K. Niedenzu, 26, Krakauerstrasse, Beuthen, Upper Silesia, Germany. International Convention date, July 23, 1920.

A mixture of calcium or strontium sulphate, carbon, and a catalyst such as halogen compounds, oxides, carbonates, or oxysalts of alkali, alkaline earth, or earth metals, is briquetted and heated with a gas containing nitrogen to 1,000°-1,300°C. Sulphur and carbon bisulphide are driven off and are condensed, while cyanamides remain in the residues. The strontium compound used may be residues obtained in sugar manufacture, in which case the catalyst is omitted.

166,888. Concentrating Copper Ores. H. Hardy-Smith, Cora Lynn, Palser Street, Woolwich, Sydney, Australia. International Convention date, July 26, 1920.

A pulp of oxidised copper ore is treated with sulphuretted hydrogen or other soluble sulphide and carbon dioxide, and the ore then separated by froth flotation. A mixture of sulphur-containing material such as ore, and charcoal, is placed in a retort 4 between netting 5, 6 and covered with a layer of lime or limestone. The retort is heated by a furnace 11 and steam from a boiler 1 is passed through to generate

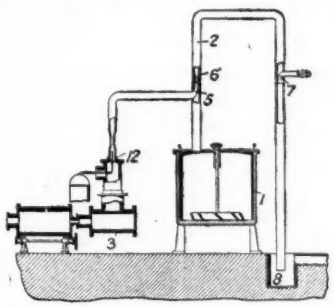


166,888

sulphuretted hydrogen. The gas evolved contains also carbon dioxide, carbon monoxide, hydrogen, steam, and sulphur, and is passed through washers into a vessel 20 containing the ore pulp. The mixture is agitated by a stirring device 21 and is tested periodically for free sulphuretted hydrogen by the sodium nitroprusside test. The passage of gas is stopped before the mixture contains free sulphuretted hydrogen, and the mixture is then transferred to a spitzkasten for the flotation process. The retort 4 may be replaced by a rotating horizontal retort.

167,132. Deodorising Gases. A. Maclachlan, Thirtieth Street, Philadelphia, Pa., U.S.A. International Convention date, July 28, 1920.

Gases resulting from the treatment of waste organic material are deodorised by means of sulphur dioxide, which is produced in a generator 3. Steam may be injected into the sulphur dioxide at 12 and the mixture passes through an injector nozzle 5 arranged in a constriction 6 in the pipe 2. The gas to be treated is contained in a tank 1 and is drawn out by the injector 5. The deodorised gas is treated with a water spray 7 and then passes through a water trap 8.



167,132

167,133. Treating Waste Organic Matter. A. Maclachlan, Thirtieth Street, Philadelphia Pa., U.S.A. International Convention date, July 28, 1920.

Waste organic matter is continuously passed through a receptacle having a rotary stirrer and a vertical baffle around which the material passes. Sulphur dioxide with or without steam is also passed through until the water contained in the material is separated. The grease is then extracted by pressing, and the residue may be used as a fertiliser.

167,143. Cellulose Butyrate. A. D. Little, Inc., Charles River Road, Cambridge, Mass., U.S.A. (Assignees of G. J. Esselen, Swampscott, Mass., and H. S. Mork, South Boston, Mass., U.S.A.). International Convention date, July 26, 1920.

Cellulose is impregnated with a mixture of sulphuric acid, 1-5 per cent., water, 5-8 per cent., and the remainder acetic acid, and the excess of solution removed. If the solution contained a small proportion of sulphuric acid, a further quantity is added to the butyrating mixture, consisting of butyric anhydride and butyric acid, after the cellulose is esterified until it is soluble in chloroform. Esterification is then continued until the cellulose ester is soluble in benzol and alcohol. The ester is also soluble in acetylene tetra-

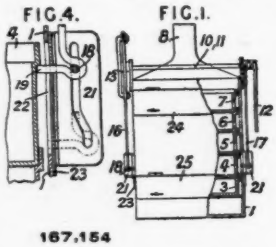
chloride, acetone, ethyl acetate, phenol, hot alcohol, hot benzol and solvent naphtha, &c.]

167,151. DRYING AGENTS. Mine Safety Appliances Co., Pittsburg, Pa., U.S.A. (Assignees of R. P. Mase, 911, Chamber of Commerce Building, Pittsburg, Pa., U.S.A.) International Convention date, June 5, 1920.

The material is an absorbent for water vapour or acid vapours in laboratory processes, or in gas masks, or for purifying air in enclosed spaces. Two parts of caustic soda are fused and one part of granular pumice added, and the material when cooled is used in granular form. Finely divided charcoal may also be added to the alkali before adding the pumice, to prevent aggregation of the mass when used for absorbing water vapour.

167,154. DRYING APPARATUS. A. Scherhag, 69, Mommsenstrasse, Charlottenburg, Berlin. International Convention date, July 30, 1920.

Material to be dried is contained in a series of superposed trays or boxes 3, 4, 5, 6, 7 over which hot air is passed upwards to the flue 8. Each tray is formed round its upper edge with a sleeve-like projection into which the bottom of the next tray fits. To lift and suspend the upper trays, a pair of rods 16, 17 on each side are suspended from cranks carried by the horizontal shafts 10, 11, the two cranks on oneside being connected by a link 13. The rods are lifted or lowered by a lever 12. The lower end of each rod is bent to support a horizontal rod 18 which slides in curved slots 21 at each end. The ends 19 of the vertical rods pass through slots 22 in the casing and lift the second tray 4 to free the lowest tray 3, while when the rods are lowered the curvature of the slot 21 frees them from the tray. The trays are inserted and removed through flaps 24, 25.



167,154

167,156. HYDROGEN PEROXIDE, DISTILLING. W. Mau, 14, Pfaffratherstrasse, Dellbrück, Cologne, Germany. International Convention date, July 26, 1920.

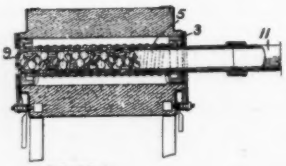
A dilute solution of hydrogen as prepared from barium peroxide and sulphuric acid is sprayed into a still in separate portions, each portion being allowed to distil separately under reduced pressure.

167,157. ALLYLARSINIC ACID. F. Hoffmann-La Roche & Co., Akt.-Ges., 184, Grenzacher Strasse, Basle, Switzerland. International Convention date, July 26, 1920.

The preparation and properties of allylarsinic acid and its calcium, magnesium, mono- and di-sodium, silver, zinc, lead, copper, cobalt, and iron salts are described. The acid is prepared by the reaction of an allyl halide and an alkali arsenite in strongly alkaline aqueous solution.

167,164. MAGNESIUM. L. Waldo, 640, West Eighth Street, Plainfield, N.J., U.S.A. International Convention date, July31, 1920.

A mixture of finely divided magnesium oxide and aluminium is pressed into tablets and distilled under vacuum in an electric furnace. The retort 7 is contained in a refractory metal tube 3 which is surrounded by a heating element 5. Magnesium is distilled off and condensed in a condenser 11.


167,164

167,171. SULPHITE LIQUORS, UTILISING WASTE GASES FROM. Zellstofffabrik Waldhof. C. Hangleiter and H. Clemm, Waldhof, Mannheim, Germany. International Convention date, August 2, 1920.

To reduce the steam required for heating up raw lye, the gases, vapours and lye passing over from pulp boilers are passed directly into raw lye in another pulp boiler. The raw lye is thereby heated to about 90°C. and enriched in sulphurous acid, and is then introduced into an emptied boiler which is still hot.

LATEST NOTIFICATIONS.

169,182. Process for the dissociation of heavy oils for the production of light "spirits." Barbet et Fils et Cie. June 22, 1917.

169,136. Manufacture and production of films of silica, alumina, or other refractory substances and apparatus for use therein. Roiboul, M. de. September 16, 1920.

169,145. Manufacture of anthraquinone. Chemische Fabriken Worms Akt.-Ges. September 13.

169,147. Treatment of oils for the hardening thereof. Haskett, W. P. September 17, 1920.

169,185. Process for preparing aliphatic dialkylaminoalkyl compounds. Farbwerke vorm. Meister Lucius ünd Bruning. September 17, 1920.

169,179. Seals for containers. National Aniline & Chemical Co., Inc. September 18, 1920.

Specifications Accepted, with Date of Application

139,814. Rotary disintegrating-mills. T. Hoffman and I. Hoffman. May 18, 1917.

143,872. Calcium carbide, Manufacture of. Union Carbide Co. January 20, 1915.

145,089. Process whereby neutral oils can be profitably recovered from their foots or soap stock. Sharples Specialty Co. May 21, 1917.

145,674. Dye-vats, Preparation of. C. Bennert. December 24, 1915.

146,092. Cellulose esters, Process of manufacture of. Soc. Chimique des Usines du Rhone Anciennement Gilliard, P. Monnet et Cartier. June 20, 1919. Addition to 13,696/14.

146,939. Ores, chemicals, minerals, and the like, Method and apparatus for treating. W. E. Trent. June 25, 1919.

146,942. Ores and other materials, Method of and apparatus for treating. W. E. Trent. July 10, 1919.

147,519. Hydrogen, Manufacture of—by means of silicon and its alloys. G. F. Jaubert. March 9, 1918.

148,358. Liquid hydrocarbons, Process for oxidising—and their oxidation products. G. Teichner. May 15, 1919.

150,734. Acid chambers, acid towers, acid mains, and similar arrangements. P. L. Pfannenschmidt. September 8, 1919. Addition to 149,667.

168,627. Sulphur dioxide from furnace gases and other gases containing the same, Method of and apparatus for the recovery of. A. H. Eustis. May 4, 1920.

168,643. Anhydrous aluminium chloride, Process for producing. P. Dankwardt. June 2, 1920.

168,651. Nitrous gases, Process of absorbing. F. W. Howorth. (*Norsk-Hydro Elektrisk Kvaelstofaktieselskab.*) June 2, 1920.

168,659. Silicic acid, Manufacture of solutions of—and the manufacture of silicate cements and silicate phosphate cements therefrom. W. Carpmael. (*Farbenfabriken vorm. F. Bayer & Co.*) June 4, 1920.

168,668. Gas scrubbing and washing apparatus. J. K. Frazer. June 5, 1920.

168,681. Ortho-oxy-azo dyestuffs, Manufacture of. A. G. Bloxam. (*Akt.-Ges. fur Anilin Fabrikation.*) June 8, 1920.

168,689. Alkylated metaphenylenediamines, Manufacture of symmetrical. British Dyestuffs Corporation, Ltd., A. G. Green, and A. Brittain. June 11, 1920.

168,720. Dust or other particles from granular substances, Machines for separating. T. Robinson & Son, Ltd., C. J. Robinson and T. J. Stevenson. June 29, 1920.

168,729. Granular, powdered or like substances, Means for mixing. A. B. Smith, H. A. Skelley, and Continuous Reaction Co., Ltd. July 2, 1920.

168,791. Tin-oxidising furnaces. W. H. Boorne. Sept. 23, 1920.

Applications for Patents

Brothers, W. Manufacture of sulphate of aluminium. 24,872. September 20.

Brown, D. Process of making liquid fuel from peat. 25,181. September 22.

Carborundum Co. & Wade, H. Manufacture of bonded crystalline mineral materials. 24,829. September 19.

Carpmeal, W. (Chemische Fabrik auf actien vorm. E. Schering,) Process for manufacture of hydroquinone. 24,859. September 19.

Casale, L. Process for synthetic production of ammonia. 24,846. September 19.

Craig, E. N., Dureco, Ltd., & Pearson, R. E. Manufacture of tungsten. 25,156. September 22.

Deeley, J. C. Apparatus for gasification of coal. 24,870. September 20.

Garda, E. Apparatus for atomising liquids. 25,006. September 21. (France, October 21, 1920.)

Hall, H. C. Process for desulphurisation of oils and oil shales. 25,251. September 23.

Laing, B. Distillation of carbonaceous materials. 24,945. September 20.

Lancaster, H. C., & R. L. H. Treatment of antimonial lead. 24,831. September 19.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to* THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

Market Report

THURSDAY, September 29.

The past week has marked a further general improvement in activity, particularly of imported products, and consequent upon the Safeguarding of Industries Act, prices show a strong upward tendency. The improvement in the position is accentuated by the fact that most Continental producers are heavily booked for some distance ahead, and the Continental competition is consequently far less virulent.

There is a fair export demand, particularly from Eastern markets and the amount of business placed has improved.

General Chemicals

ACETONE is in steady demand at recent prices.

ACID ACETIC.—There is considerable competition for the limited quantities available for early delivery, and the price is buoyant.

ACID CITRIC.—A fair business is reported, but demand is still below the normal.

ACID FORMIC is stronger in tone and stocks are regarded as inadequate.

ACID OXALIC is again firmer, and a satisfactory demand is indicated.

ACID TARTARIC is dearer in price, and the demand has been more active.

BLEACHING POWDER remains in an unsatisfactory position, and the turnover is small.

COPPER SULPHATE.—Whilst the position is regarded as somewhat better in several quarters, the active business reported shows little improvement.

FORMALDEHYDE has fully maintained its advance in price, and a steady business is passing.

IRON SULPHATE remains unchanged.

LEAD ACETATE is again dearer, and a slightly better business is reported.

LEAD NITRATE is in better demand, and a higher price is not unlikely.

LITHOPONE is slow of sale and tends to favour buyers.

POTASSIUM CARBONATE.—There is little change to report. The demand is very slow, but the price is steady.

POTASSIUM CAUSTIC.—There seem to be considerable stocks and purchases can probably be made below the nominal price.

POTASSIUM CHLORATE is firmer, but demand continues spasmodic.

POTASSIUM PRUSSIATE is considerably higher in price, and in short supply.

SODIUM ACETATE.—Stocks have been much competed for, and the price has again advanced.

SODIUM BICHROMATE is a healthier market, and second-hand parcels command a better figure.

SODIUM CAUSTIC.—The position is gradually improving, but there is much lee-way to be made up.

SODIUM NITRATE has been in fair demand at recent prices.

SODIUM PHOSPHATE is inclined to be firmer, and there is more inquiry about.

SODIUM PRUSSIATE is higher in price, and stocks are readily absorbed.

SODIUM SULPHIDE is unchanged.

Coal Tar Products

There is little change in the market for coal tar products since last week.

90 PER CENT. BENZOL is still very scarce and the prices at the moment are 3s. on rails in London and 2s. 9½d. to 2s. 10d. in the north.

PURE BENZOL is quoted at 3s. 6d. on rails.

CREOSOTE OIL is slightly weaker and there are many sellers at 8d. on rails in the north and 8½d. in the south.

CRESYLIC ACID has a very small inquiry and is quoted at 2s. 3d. on rails for dark and 1s. 10d. to 2s. for pale.

SOLVENT NAPHTHA is in good demand, and is worth about 2s. 9d. on rails in the midlands, and 3s. in the south.

NAPHTHALENE is very quiet, crude qualities being worth from £5 to £8 per ton, while refined are worth from £15 to £17 per ton.

Coal Tar Intermediates

Business remains in a quiet state, but inquiries have been received in fair volume and trade appears to be slowly reviving.

ALPHA NAPHTHYLAMINE continues to be inquired for and prices are unchanged.

ALPHA NAPHTHOL has been inquired for both at home and for export, and a number of orders have been booked at recent quotations.

ANILINE OIL & SALT.—A steady small business is being done at about maker's figures.

ANTHRAQUINONE continues to be asked for.

BETA NAPHTHOL remains a quiet market with the price unchanged, but a certain amount of business is passing.

DIMETHYLANILINE.—A certain amount of business has passed at recent values and a rise in price is not unlikely in this material

DIPHENYLAMINE has been inquired for both for home and export trade, but the quotation is unchanged.

PARANITRANILINE is steady at latest quotations.

RESORCINE is in fair demand at recent figures.

SALICYLIC ACID is quiet with the price unchanged.

Sulphate of Ammonia

There is a fairly good demand for export, and prices have an upward tendency.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	1	to	0	2	2
Acetone oil	ton	87	10	0	to	90	0	0
Acetone, pure	ton	90	0	0	to	95	0	0
Acid, Acetic, glacial, 99-100%	ton	60	10	0	to	62	10	0
Acetic, 80% pure	ton	45	0	0	to	48	0	0
Arsenic	ton	95	0	0	to	100	0	0
Boric, cryst	ton	65	0	0	to	68	0	0
Carbolic, cryst. 39-40%	lb.	0	0	6½	to	0	0	7
Citric	lb.	0	2	5	to	0	2	6
Formic, 80%	ton	65	0	0	to	67	10	0
Gallic, pure	lb.	0	3	9	to	0	4	0
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	43	0	0	to	45	0	0
Lactic, 60 vol.	ton	46	0	0	to	48	0	0
Nitric, 80 Tw.	ton	38	0	0	to	40	0	0
Oxalic	lb.	0	0	8½	to	0	0	9
Phosphoric, 1.5	ton	45	0	0	to	47	0	0
Pyrogallic, cryst	lb.	0	7	3	to	0	7	6
Salicylic, Technical	lb.	0	1	2	to	0	1	3
Salicylic, B.P.	lb	0	1	6	to	0	1	7
Sulphuric, 92-93%	ton	8	0	0	to	8	10	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	1	5	to	0	1	6
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	37	10	0	to	40	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	12	0	0	to	13	0	0
Aluminium, sulphate, 17-18%	ton	15	0	0	to	16	0	0
Ammonia, anhydrous	lb.	0	2	0	to	0	2	2
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	4	to		—	
Ammonia, chloride	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)	ton	45	0	0	to	47	10	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0

	per	£	s.	d.		£	s.	d.
Ammonia, phosphate	ton	85	0	0	to	90	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	0
Amyl acetate	ton	150	0	0	to	160	0	0
Arsenic, white, powdered	ton	38	0	0	to	40	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	15	0	0	to	16	0	0
Nitrate	ton	42	10	0	to	45	0	0
Barium Sulphate, blanc fixe, dry	ton	26	0	0	to	28	0	0
Sulphate, blanc fixe, pulp	ton	16	0	0	to	16	10	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0
Bleaching powder, 35-37%	ton	14	0	0	to		—	
Borax crystals	ton	31	0	0	to	32	0	0
Calcium acetate, Brown	ton	8	0	0	to	9	0	0
,, Grey	ton	10	0	0	to	11	0	0
Calcium Carbide	ton	22	0	0	to	23	0	0
Chloride	ton	12	10	0	to	13	0	0
Carbon bisulphide	ton	60	0	0	to	62	0	0
Casein, technical	ton	85	0	0	to	90	0	0
Cerium oxalate	lb.	0	3	6	to	0	3	9
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	11	0	to	0	11	6
Oxide, black	lb.	0	16	0	to		—	
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	28	10	0	to	29	10	0
Cream Tartar, 98-100%	ton	135	0	0	to	140	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol.	ton	95	0	0	to	97	0	0
Formusol (Rongalite)	lb.	0	3	9	to	0	4	0
Glauber salts, commercial	ton	5	5	0	to	5	10	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	45	0	0	to	50	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	48	0	0	to	50	0	0
Carbonate (White Lead)	ton	43	0	0	to	46	0	0
Nitrate	ton	48	10	0	to	50	10	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	26	0	0	to	28	0	0
Magnesium chloride	ton	12	0	0	to	13	0	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	10	10	0	to	11	10	0
Sulphate (Druggists')	ton	15	10	0	to	17	10	0
Manganese, Borate	ton	70	0	0	to	75	0	0
Sulphate	ton	70	0	0	to	75	0	0
Methyl acetone	ton	85	0	0	to	90	0	0
Alcohol, 1% acetone	ton	105	0	0	to	110	0	0
Nickel sulphate, single salt	ton	65	0	0	to	66	0	0
Nickel ammonium sulphate, double salt	ton	67	0	0	to	68	0	0
Potash, Caustic	ton	33	0	0	to	33	10	0
Potassium bichromate	lb.	0	0	9	to		—	
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride	ton	36	0	0	to	38	0	0
Chlorate	lb.	0	0	5	to	0	0	5½
Meta bisulphite, 50-52%	ton	120	0	0	to	125	0	0
Nitrate, refined	ton	45	0	0	to	47	0	0
Permanganate	lb.	0	1	2	to	0	1	4
Prussiate, red	lb.	0	2	4	to	0	2	6
Prussiate, yellow	lb.	0	1	2½	to	0	1	3
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt	3	5	0	to		—	
Seconds	cwt	3	0	0	to		—	
Sodium acetate	ton	28	0	0	to	30	0	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	6½	to	0	0	7
Bisulphite, 60-62%	ton	27	10	0	to	30	0	0
Chlorate	lb.	0	0	4½	to	0	0	5
Caustic, 70%	ton	24	0	0	to	24	10	0
Caustic, 76%	ton	25	10	0	to	26	0	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	15	0	0	to	16	0	0
Nitrite, 96-98%	ton	40	0	0	to	42	0	0
Phosphate, crystal	ton	23	10	0	to	25	10	0
Perborate	lb.	0	1	6	to	0	1	7
Prussiate	lb.	0	0	8½	to	0	0	9
Sulphide, crystals	ton	17	0	0	to	18	0	0
Sulphide, solid, 60-62%	ton	23	10	0	to	24	10	0
Sulphite, cryst.	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	80	0	0	to	85	0	0
Strontium Nitrate	ton	70	0	0	to	72	10	0
Strontium Sulphate, white	ton	7	10	0	to	8	10	0
Sulphur chloride	ton	41	0	0	to	42	0	0
Sulphur, Flowers	ton	13	0	0	to	14	0	0
Roll	ton	13	0	0	to	14	0	0
Tartar emetic	lb.	0	1	6	to	0	1	7
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Tin Perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride, 102 Tw.	ton	21	0	0	to	22	10	0
Chloride, solid, 96-98%	ton	50	0	0	to	55	0	0
Oxide, 99%	ton	40	0	0	to	42	0	0
Dust, 90%	ton	47	10	0	to	50	0	0
Sulphate	ton	21	10	0	to	22	10	0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	3	3	to	0	3	6
Alphanaphthol, refined	lb.	0	3	9	to	0	4	0
Alphanaphthylamine	lb.	0	2	6	to	0	2	8
Aniline oil, drums extra	lb.	0	1	5	to	0	1	6
Aniline salts	lb.	0	1	6	to	0	1	7
Anthracene, 40-50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	4	3	to	0	4	6
Benzidine, base	lb.	0	6	0	to	0	6	6
Benzidine, sulphate	lb.	0	6	6	to	0	7	0
Benzoic acid	lb.	0	2	3	to	0	2	6
Benzoate of soda	lb.	0	2	3	to	0	2	6
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	6	9	to	0	7	0
Betanaphthol	lb.	0	2	3	to	0	2	6
Betanaphthylamine, technical	lb.	0	9	0	to	0	9	6
Croceine Acid, 100% basis	lb	0	4	6	to	0	5	0
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	2	9	to	0	3	0
Dimethylaniline	lb.	0	3	9	to	0	4	0
Diphenylamine	lb.	0	4	6	to	0	4	9
H-Acid	lb.	0	8	0	to	0	8	6
Metaphenylenediamine	lb.	0	5	6	to	0	5	9
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	6	6	to	0	7	0
Monosulphonic Acid (2:7)	lb.	0	7	0	to	0	7	6
Naphthionic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	4	9	to	0	5	0
Nitronaphthalene	lb.	0	1	4	to	0	1	5
Nitrotoluol	lb.	0	1	3	to	0	1	4
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	0	10	to	0	1	0
Para-amidophenol, base	lb.	0	12	0	to	0	12	6
Para-amidophenol, hydrochlor	lb	0	12	6	to	0	13	0
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	4	6	to	0	4	9
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	13	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	3	9	to	0	4	0
Resorcin, technical	lb.	0	5	0	to	0	5	6
Resorcin, pure	lb.	0	8	0	to	0	8	6
Salol	lb.	0	2	6	to	0	2	9
Sulphanilic acid, crude	lb.	0	1	4	to	0	1	6
Tolidine, base	lb.	0	6	6	to	0	7	0
Tolidine, mixture	lb.	0	2	6	to	0	2	9

Potash Prices

THE trade in potash fertilisers at this season shows more activity than has been evident for many months past. Although merchants are reluctant to place orders in advance of sales, the larger buyers are clearing very freely. The consistent demand seems to indicate that farmers have decided to make up the leeway in potash manuring whilst prices are at rock bottom.

Quotations during the past week have been approximately as follows :—

F.O.R. LONDON

French kainit, 14 per cent.
£3 7 6 to £ 3 10 0 in bags
Sylvinite, 20 per cent. ... ... £ 4 7 6 ,,
,, 30 per cent. ... 6 11 6 ,,
Muriate of potash, 50 per cent. ... 12 6 0 ,,
Sulphate of potash, 90 per cent.
purity ... ... 16 0 0 ,,

The prospects of increased trade in the Colonies now seem fairly bright, but in America the market is exceedingly dull.

Company News

ROOIBERG MINERALS DEVELOPMENT CO., LTD.—The annual meeting will be held in Johannesburg on October 26.

AMERICAN CYANAMID.—Payment of the quarterly dividend on the American Cyanamid Co.'s cumulative preferred stock, due to-day (Saturday), has been deferred.

ENGLISH MARGARINE WORKS (1919).—A dividend of 3½ per cent., less tax, on the preference shares for the half-year, on account of arrears was payable on Thursday.

INDO-BURMA OILFIELDS (1920), LTD.—The subscription lists in connexion with the issue of £250,000 10 per cent. convertible first mortgage debenture stock were closed on Monday. Country applications were considered up to Tuesday morning.

BURMAH OIL CO., LTD.—A Stock Exchange announcement under Rule 148A allows dealings in 1,210 shares of £1 each fully paid, Nos. 5,149,753 to 5,150,962. These securities will rank *pari passu* with those in which special settling days have already been appointed as soon as they are identical and the certificates are ready for distribution, and with those for which an official quotation has already been granted as soon as they are identical and are officially quoted.

LEVER BROTHERS, LTD.—Under Rule 148A a Stock Exchange announcement allows dealings in 4,000 7 per cent. preference shares of £1 each fully paid, Nos. 23,560,663 to 23,564,662. These securities will rank *pari passu* with those in which special settling days have already been appointed as soon as they are identical and the certificates are ready for distribution, and with those for which an official quotation has already been granted as soon as they are identical and are officially quoted.

BRITISH GLASS INDUSTRIES.—The report to March 31 last states that during the year the dividends declared by subsidiary and allied companies were limited to £109,563, owing primarily to the fact that a large portion of the profits earned by the several companies was expended on extension of works and other capital purposes. By reason of this, and owing to the loss sustained at the Canning Town factory (which was only completed during the year), and to interest on loans and overhead charges, the balance-sheet shows a loss of £23,217. The directors point out that the disappointing trading results were accentuated by the sudden and serious slump in trade which occurred during the latter half of the year under review. The directors continue to give close and earnest attention to strengthening the position of the company and its various subsidiary and allied companies, and are making changes and effecting every possible economy with that object in view. Meeting, Cannon Street Hotel, October 5, at 2.30 p.m.

MAGADI SODA CO., LTD.—Speaking at the annual meeting on Monday, the chairman (Mr. S. Samuel, M.P.) said the profit and loss account showed a debit balance of £159,326 17s., against a debit balance for 1919 of £96,832 0s. 10d. This figure included £29,997 for debenture interest, against £20,393 15s. 10d. in the previous year. It also included for the first time an amount of £49,341 14s. 8d. for depreciation. It was the intention of the directors to carry on the business on a conservative and sound principle, and under the circumstances they must not be afraid to face an adverse balance-sheet rather than to mislead the shareholders and the public. They had hitherto refrained from writing off depreciation, as they had not started actual working, but the time had now come when they could no longer ignore the fact that machinery and material depreciated, and that unless they did write off, the Inland Revenue would not give credit. In 1919 there was a loss of £25,412 16s. 9d. in exchange. This year they showed a small profit of £1,401 16s. under this heading. With regard to the balance-sheet, the principal items remained unchanged. Owing to the commencement of work, they had to hold larger stock, so that on the liability side they had creditors of £30,344 10s. 5d., which in the previous year amounted to £40,000, and there was a loan from the bank of £4,500 and bills payable and in transit £23,112 10s., which figures do not appear in the balance-sheet of the previous year. On the asset side sundry stores had increased from £74,000 to £137,509 6s. 5d. The stock in hand was reduced from £106,000 to £39,000, in consequence of shipments of granular soda. Sundry debtors had increased by £900. An account of the meeting appears on another page.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
Canada ...	Chemicals used in educational or mechanical laboratories	—
Winterthur ...	Chemicals; pharmaceutical products; soap; dye; bleaching; tanning industries	—
San Francisco	Heavy chemicals; non-ferrous metals	—

Tariff Changes

EGYPT.—Until further notice, chemicals and drugs, except chemical manures, may be exported from Egypt to any destination with which trade is allowed, without a specific licence from the Department of Supplies. A Decree dated August 22, which amends the Decree of June 25 last, revises the Customs duties on alcoholic liquors by providing that where the specific duty on perfumery and toilet preparations containing alcohol amounts to less than a duty of 10 per cent. *ad valorem*, the latter duty shall be levied.

KENYA.—As from August 10 chemicals, scientific instruments, kerosene oil and petroleum, liquid fuel, paint, soap and turpentine are liable to an import duty of 10 per cent. *ad valorem*. The export of petrol and natalite is now exempt from Customs duty.

ITALY.—The excise tax on acetic acid is fixed at rates varying from 50 to 600 lire per quintal (according to the anhydrous acetic acid content) as from September 4.

POLAND.—*The Board of Trade Journal* of September 22 publishes on p. 310 a list of goods which become liable to Customs duty as from September 7 until November 30. The list refers to certain oils, chemicals, dyeing materials, &c.

Soap Trade Workers' Wages

A NATIONAL delegate meeting of the four trade unions represented on the Soap and Candle Trades' Joint Industrial Council was held on September 25 at the Midland Hotel, St. Pancras, to consider the present position with regard to the suggested reductions in wages. A manifesto was drawn up for circulation to members, and it was decided to publish an extract from the minutes of the meeting of the Joint Industrial Council, held in London, on September 15 last.

The extract stated that the employers gave "definite notice of their fixed intention" to reduce wages by 2s. a week to men in October and a further 2s. in December, and in the case of women 1s. a week in October, 1s. in December, and, in addition, that all firms now paying more than the standard rate for class "A" towns now reduce their wages to the standard rate.

The minutes were read to the national delegate meeting on Sunday last, and reports were taken at the meeting. Delegates produced copies of certain notices that had, they alleged, been posted up by various firms during last week. One of the notices referred to contained the statement, "It means, therefore, that the only definite reduction is 2s. for males and 1s. for females, and notice is hereby given that this reduction will become operative on October 4. If there is no justification for a further reduction in December it will not be made."

The workers' delegates' manifesto went on: "We definitely state that this offer has never been made to the Joint Industrial Council, and we are now asking for an immediate meeting of the Joint Industrial Council to receive an explanation from the employers as to why this offer made to the workpeople differs from the offer made to the workpeoples' representatives on the Joint Industrial Council."

A resolution was passed instructing the workpeople's side of the council to arrange a full meeting of the council to secure some explanation from the employers.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Notice of Dividend

TIBBITTS, CHARLES WILLIAM, of Oakleigh, London Road, Mitcham, Surrey, and ANDERTON, HARRY JAMES, of 59, Welldon Crescent, Harrow, Middlesex, carrying on business in partnership under the style of The Carlton Dry Cleaning and Dyeing Works, at Church Road, Mitcham, Surrey, dyers and cleaners. Amount per £, 3s. 1d., first and final, payable October 13, Offices of the Official Receiver, 132, York Road, Westminster Bridge Road, S.E.1.

Partnership Dissolved

GIBSON, WILLIAM LOMAX, and LOMAX, JOHN KNIGHT, as dyers and finishers, at Cooper Street, Hyde, Chester, under the style of the Hyde Dyeing & Raising Co., by mutual consent as from May 30, 1921. Debts received and paid by W. L. Gibson, who will continue the business.

Bankruptcy Information

MOODY, WILLIAM EDMONDSON, 3, Market Place, Driffield, co. York, chemist and mineral water manufacturer. First meeting, October 4, 11.30 a.m., Official Receiver's Offices, York City Bank Chambers, Lowgate, Hull. Public examination, November 14, 2 p.m., Guildhall, Alfred Gelder Street, Hull.

Company Winding Up

NOBLE'S DRUG STORES, LTD., 2, Well Street, Cable Street, London, E. First meetings: creditors, October 5, 11.30 a.m.; and contributories, October 5, 12 noon, 33, Carey Street, Lincoln's Inn, London, W.C.2.

Liquidators' Notices

CALE CHEMICAL CO., LTD.—General meeting at Cale Distillery, Hutton Road, Lambeth, S.E.11, on Thursday, October 27, at 3 p.m., to receive liquidator's report of winding-up.

PHOENIX CHEMICAL CO., LTD. (in liquidation for reconstruction).—General meeting on Tuesday, October 25, at 12.30 p.m., at 53, Doughty Street, London, to receive liquidator's report of the winding-up of the company, disposed of to the Phoenix Chemical Co. (1919), Ltd., which is now carrying on the business.

VIVIAN SOAP CO. (ROCHESTER), LTD. (in liquidation).—Meeting of creditors on Wednesday, October 5, 1921, at 12 noon. E. Layton Bennett, liquidator, 31-32, Broad Street Avenue, Blomfield Street, London, E.C.2.

Edinburgh Gazette

The firm of IVIE, HAIR & CO., carrying on business as soap manufacturers, oil refiners, general merchants and drysalters, in Glasgow and Paisley, was dissolved, by mutual consent, as at May 31, 1921, by the retiral of John Alexander Ferguson. George Ferguson, William Simpson Falconer, Thomas Crawford Storrie, and Donald M'Neil will continue the business and will receive or pay all debts.

Bill of Sale

[The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.]

SKEAT, CHARLES, 609, High Road, Tottenham, chemist. September 21. £30.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

EDWARDS, JAMES MACHONICHE, 311, Fulham Palace Road, S.W., chemist. £44 9s. August 2.

ESTLICK, C. T., 127, Camden Road, N.W., chemist. £14 18s. August 6.

CHEETHAM, R. S., The Modern Pharmacy, 48, Broad Bridge Street, chemist. £22 18s. 2d. August 10.

WALKER, JAMES, 2, Stevenson Street, East Ordsall Lane, Salford, manure dealer and farmer. £18 16s. 10d. July 27.

DAVIES, S., 269, Pentonville Road, King's Cross, chemist. £13 7s. 11d. August 4.

SMITH, P. P., 170, Westgate, Bradford, chemist. £10 14s. 4d. August 10.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.]*

ALBY UNITED CARBIDE FACTORIES, LTD., London, E.C.—Registered September 15, £10,000 mortgage, to Bank; second charge (subject to first charge) on all the carbide specified in first schedule thereto, and all other (if any) carbide now belonging to company and floating charge on carbide not specifically comprised in this security which may at any time during this security belong to the company. *£132,947 1s. August 13, 1920.

BROWNING (WM.) CO., LTD., London, N.W., chemists, &c.—Registered September 16, debtor securing £94,044, and further advances, to Anglo-American Oil Co., Ltd., 36, Queen Anne's Gate, Westminster; general charge. *Nil. June 30, 1921.

GRAHAM & COPE, LTD., Dewsbury, dye, chemical and soap manufacturers.—Registered September 14, £9,000 debentures, to F. W. Ramsbottom and another, 43, Spring Gardens, Manchester; general charge.* £3,000. March 29, 1921.

LUCE'S EAU-DE-COLOGNE CO., LTD., Southampton.—Registered September 14, £7,000 (not ex.) charge, to Lloyds Bank, Ltd.; charged on 100 & 102, French Street, Southampton. *Nil. May 15, 1920.

Bankruptcy Jurisdiction

THE *London Gazette* states that the Lord Chancellor has made an order under Section 97 of the Bankruptcy Act, 1914, assigning the bankruptcy jurisdiction of the High Court of Justice to the Chancery Division, instead of the King's Bench Division. The order will come into effect on October 12. The Hon. Mr. Justice Astbury and the Hon. Mr. Justice P. O. Lawrence will be the Judges, by or under the direction of whom all business so assigned will be ordinarily transacted and disposed of.

Explosion in Edinburgh Chemical Works

AN alarming explosion took place on Tuesday afternoon at Blandfield Chemical Works, Wheatfield Road, Gorgie, Edinburgh, the premises of Messrs. T. and H. Smith, Ltd., as a result of which Mr. James Young, an assistant chemist, was killed, and a process worker named James Simpson was severely burned about the head and arms. These were the only two employees in the department at the time. The explosion is understood to have taken place in the codein section of the works and caused an outbreak of fire, which was soon extinguished by the Fire Brigade. Mr. Simpson was removed to the Royal Infirmary.